DOCUMENTATION GROUP **Document 502-81**

A GLOSSARY OF RANGE TERMINOLOGY

WHITE SANDS MISSILE RANGE
KWAJALEIN MISSILE RANGE
YUMA PROVING GROUND
DUGWAY PROVING GROUND
ABERDEEN TEST CENTER
NATIONAL TRAINING CENTER

NAVAL AIR WARFARE CENTER -WEAPONS DIVISION
ATLANTIC FLEET WEAPONS TRAINING FACILITY
NAVAL AIR WARFARE CENTER -AIRCRAFT DIVISION
NAVAL UNDERSEA WARFARE CENTER DIVISION, NEWPORT
PACIFIC MISSILE RANGE FACILITY
NAVAL UNDERSEA WARFARE CENTER DIVISION, KEYPORT

45TH SPACE WING
AIR FORCE DEVELOPMENT TEST CENTER
30TH SPACE WING
AIR FORCE FLIGHT TEST CENTER
AIR WARFARE CENTER
ARNOLD ENGINEERING DEVELOPMENT CENTER
GOLDWATER RANGE

DOCUMENT 502-81

A GLOSSARY OF RANGE TERMINOLOGY

Prepared by

DOCUMENTATION GROUP
RANGE COMMANDERS COUNCIL

Published by

Secretariat
Range Commanders Council
White Sands Missile Range,
New Mexico 88002-5503

FOREWORD

1. SCOPE -- This glossary contains definitions, acronyms, occasional abbreviations and other information used in daily operations at the major test ranges and facilities. Some of the terminology is peculiar to certain activities, while other terms are common in usage and application.

2 . SOURCE MATERIAL -- The basic issue of this glossary was a compilation of information from the other groups of the Range Commanders Council (RCC). This revision incorporates additional contributions, suggestions and recommendations submitted by these sources since publication of the basic issue.

3 . ARRANGEMENT -- Major terms and subdivisions are listed alphabetically. Cross-references are used for clarification when necessary.

4 . CHANGES -- It is generally recognized that there are some areas of definition which will not conform to the concept of all users and that some errors will have escaped detection. Also, newer definitions, more recent data and authoritative terminology will result from ever-expanding usage, research and adoption. It is therefore realized that additions and changes to this work must be collected continuously and issued periodically. Submission of such material in this interest is encouraged. All sources must be identified and comments and suggestions should be addressed to:

Documentation Group
c/o Secretariat
Range Commanders Council
ATTN: STEWS-SA-R
White Sands Missile Range
New Mexico 88002

A

ABERRATION -- 1. Failure of rays to focus to a perfect image. **2.** Defect causing such failure.

ABORT -- Failure to accomplish a mission for any reason other than enemy action; may occur at any point from initiation of an operation to destination.

ABORT ZONE (safety) -- That area surrounding the launch within which malfunctioning missiles will be contained with known and acceptable probability.

ABRASION MARKS -- Dark lines resembling scratches on negatives or prints caused by rubbing the emulsion before development or occasionally by winding a roll too tightly. (See cinching.)

ABSOLUTE ADDRESS -- The label or number permanently assigned to a specific storage location, device or register.

ABSOLUTE BINARY CARDS -- Cards containing as many as twenty-two 360-bit binary words together with an origin for the first word, a word count and a check sum.

ABSOLUTE CODING -- Coding in which instructions are written in the basic machine language, e.g., absolute addresses, absolute operators.

ABSOLUTE HUMIDITY -- The mass of water vapor per unit Volume of air (also known as vapor concentration and vapor density).

ABSOLUTE PRESSURE -- Pressure referenced to a total vacuum.

ABSOLUTE SYSTEM OF UNITS -- A system of units in which a small number of units is chosen as fundamental, e.g., units of mass, length, time and charge.

ABSOLUTE TEMPERATURE SCALE (OA) -- (See **Kelvin temperature scale**.)

ABSOLUTE ZERO -- The zero point of the Kelvin temperature scale, of fundamental significance in thermodynamics and statistical mechanics. May be interpreted as the temperature at which the volume of a perfect gas vanishes, or more generally the temperature of the cold reservoir which would render a Carnot cycle 100 percent efficient. The value of absolute zero is indicated as $-273.16^0 \pm .01^0$, $-459.8^o F$, *or* ^0K.

ABSORPTION HYGROMETER -- A hydrometer which measures the water vapor content of the atmosphere by absorption of the vapor by a hygroscopic chemical; a chemical hygrometer. The amount of vapor absorbed may be. determined in an absolute manner by weighing the hygroscopic material, or in a nonabsolute manner by measuring a physical property of the subwater vapor absorbed. Lithium chloride humidity strips and carbon-film hygrometer elements are examples of the latter.

ACCELERATION -- The time rate of velocity change. A vector quantity.

ACCELERATION COMPONENT -- That part of a total acceleration which is effective in a specified direction, such as one of the coordinate axes.

ACCELERATION ERROR -- 1. In general, the difference at any time between the measured value of the acceleration and its specified or desired value. An analysis of these differences will yield maximum, minimum and average root-mean-square (RMS) values. **2.** In transducers, the maximum difference (at room conditions and at any measured value within the specified range) between output readings taken before and during the application of specified constant acceleration along specified axes. (See **traverse sensitivity [sensitivity, transducer]** when applied to acceleration transducers.)

ACCELEROMETER -- A transducer which measures acceleration and gravitational forces capable of imparting acceleration. (See **integrating accelerometer**.)

ACCELEROMETER DYNAMIC TEST -- A test performed on an accelerometer to gain information on the overall behavior, frequency response and natural frequency of the device.

ACCELEROMETER SENSITIVITY -- The difference between the output at zero acceleration and the output measured at a given steady-state acceleration. Usually expressed in percent of full scale output "g". May be expressed as output difference under acceleration at zero stimulus or at some other value of the stimulus.

ACCESS TIME -- The time required to condition a storage unit or device to receive or transmit data after the instruction to do so is given.

ACCIDENT (safety) -- A flight safety incident which causes injury or damage to public or private property.

ACCURACY -- The residual statistical difference between a measured or computed value and the true value. High accuracy requires high precision. This term applies to the system for acquiring and processing the information, not on the media on which it is displayed. Instrumental -- The accuracy of a measurement after the errors caused by elements external to the instrument are removed. A measure of the accuracy of the instrument proper**.**

Transducer -- The ratio of the error to the full-scale output (expressed as "within ± 'xx' percent of full-scale output") or the ratio of the error to the output, expressed in percent.

ACOUSTICS -- The science of sound, including its production, transmission and effects.

ACOUSTIC VELOCITY -- (See **velocity of sound**.)

ACQUISITION DATA -- Data that assists in optically, manually, mechanically, or electronically orienting a data sensor in deviation and/or range to locate a test vehicle.

ACTIVATION -- The process of making a material radioactive by bombardment with neutrons, protons or other nuclear particles.

ACTIVE FRONT -- A front (weather system), or portion thereof, which produces appreciable cloudiness and, usually, precipitation.

ACTIVE LEG (transducer) -- An electrical element within a transducer whose electrical characteristics are a function of stimulus.

ACTIVE REMOTE SENSING DEVICE -- One which provides the radiant energy (radar, laser); usually more versatile than a passive remote sensing device. Can control the output of the transmitter.

ACTIVE SCORER -- One which requires that the munition being scored contain a source of electromagnetic energy; a transponder, transmitter or other radiating device.

ACTIVE TRACKING SYSTEM -- A system which requires addition of a transponder or responder onboard the vehicle to repeat or retransmit information to the tracking equipment. **Examples:** DOVAP, SECOR, AZUSA.

ACTUAL ADDRESS -- (See **absolute address**.)

ACUITANCE -- The physical or objective measure of photographic image sharpness.

ADD TIME -- The time required for one addition not including the time required to obtain the quantities from storage and return them.

ADDRESS -- 1. A label, name or number identifying a register, location or unit where information is stored. **2.** The operand part of an instruction. **3.** In communications, the coded representation of the destination of a message.

ADDRESS MODIFICATION (computer) -- The process of changing the address part of a machine instruction in a stored-program computer by means of an arithmetic operation.

ADEQUATE SOURCE (safety) -- An instrumentation source which can protect the applicable impact limit line without endangering a normal missile.

ADIABATIC PROCESS -- A thermodynamic change of state of a system in which there is no transfer of heat or mass across the boundaries of the system. In Such a process, compression always results in warming, and expansion results in cooling. In meteorology, this process is often considered one which is reversible. For many purposes, changes of state in the free atmosphere over periods of, for example, 2 days or less are assumed to he adiabatic.

ADJUSTMENT (leveling) -- The determination and application of corrections to orthometric differences of elevation or to orthometric elevations to make the elevations of all bench marks consistent with independent of the circuit closures. (See **correction, orthometric**.)

ADJUSTMENT OF OBSERVATIONS -- The determination and application of corrections to survey observations, making the observations consistent among themselves and the coordination and the correlation of the derived data. The object of adjustment is to provide the best or most probable values of results obtainable from a series of survey observations, and to coordinate and correlate those results within the survey itself and with previously existing basic data. This is accomplished by mathematical analysis using the method of least squares or, mechanically, by graphical methods such as employed in plane-table surveying. The mathematical adjustment involves the solution of certain condition equations or observation equations.

ADVECTION -- The process which transports an atmospheric property solely by the mass motion (velocity field) of the atmosphere; also, the time rate of change of the value of the advected property at a given point.

AERODYNAMIC DESTRUCT (safety) -- A means of flight termination which uses the control surfaces of the missile to cause it to dive into the earth's surface or to assume such an attitude that it will break into unstable pieces.

AERONOMY -- The basic term denoting the physics of the upper atmosphere; concerned with upper-atmospheric composition (i.e., the nature of constituents, density, temperatures, etc.) and chemical reactions.

AEROSPACE VEHICLE -- One which functions in both the sensible atmosphere and the space equivalent or space environment.

AGITATION (photography) -- The movement of film and/or developer solution to obtain continual change of solution at the surface of the material being developed.

AIDED TRACKING -- A tracking control system in which a computing device (usually analog) interacts with the operator.

AIR LAUNCH AREA (safety) -- The air mass within visual distance of the aircraft from which the launching of an air-launched missile is to be attempted, This includes the sea area 10 nautical miles forward of the air area and 2 nautical miles on either side of the launch azimuth.

AIR MASS -- A widespread body of air whose properties have been established while situated over a particular region of the earth's surface (air-mass source region), and has undergone specific modifications while in transit away from the source region. Often defined as a widespread body of air that is approximately homogeneous in its horizontal extent, particularly with reference to temperature and moisture distribution. In addition, the vertical temperature and moisture variations are approximately the same over its horizontal extent.

AIR PRESSURE -- The pressure exerted by air. A very general term used in cases where a limited volume of air is concerned, i.e., within an enclosed space. This term should never be used to denote a directional force such as wind pressure.

AIRSPACE -- Space above the surface of the earth or a particular portion of such space; usually defined by the boundaries of an area on the surface, projected upward.

Controlled -- Airspace within which some or all aircraft may be subject to air traffic control (continental control area, control area, control zone or transition area).

AIRSPACE -- (continued)

Navigation -- Airspace above certain minimum safe altitudes prescribed by proper authority within which air navigation is permissible.

Prohibited area -- Designated airspace within which aircraft are prohibited.

Restricted area -- Designated airspace within which aircraft are not wholly prohibited, but subject to restriction.

ALGORITHM -- A plan detailed enough to show the step-by-step procedure for the solution of a complex mathematics or logic problem.

ALIGNMENT -- The process of adjusting a system to produce the desired operating characteristics, e.g., the adjusting of variables in a receiver for optimum operation.

ALLOCATE (computer) -- To assign storage locations to the main routines, subroutines and data, thereby fixing the absolute values of any symbolic addresses.

ALLOCATION -- (See **radio frequency allocation to equipment**.)

ALLOTMENT -- (See **frequency allotment**.)

ALTITUDE -- 1. The perpendicular distance from a reference line or level to an object or point in space. **2.** The vertical angle between the plane of the horizon and the line to the object which is observed or defined.

AMBIENT -- Surrounding on all sides; encompassing; enveloping, as temperature or pressure; an encompassing atmosphere.

AMBIENT PRESSURE ERROR (transducer) -- The maximum change in output at any measured value within a specified range when the pressure surrounding the transducer is changed from room conditions to specified extremes.

AMBIGUITY -- The data obtained from a trajectory system uniquely defines a set of solutions from which the right one must be determined from additional data; e.g., the number of half wavelengths of phase which exist in determining an angle or range by the use of phase comparison techniques, the number of wavelengths between an interferometer antenna pair multiplied by two, or the half wavelength of a modulation or carrier frequency used to determine range by phase comparison techniques.

AMPLIDYNE -- A special dc Generator in which the output voltage responds to changes in field excitation; used extensively as a part of a servo system or as a power amplifier.

AMPLITRON -- A nonresonant crossfield vacuum tube; one of a family of platinotrons.

AMPLITUDE -- A measure of the departure of a phenomenon from any given reference. When applied to vibratory conditions, pertains generally to the peak of magnitude of the acceleration applied.

ANALOG (ANALOGUE) -- 1. In a scientific sense, that which follows the same mathematical relations, e.g., an electrical analog to a mechanical system. **2.** In synoptic meteorology, a past large-scale synoptic weather pattern which is characteristic of a given (usually current) situation.

ANALOG CHANNEL -- A channel on which information is presented in a continuous form.

ANALOG DATA -- Data represented in a continuous form, as contrasted with digital data represented in a discrete (discontinued) form. Analog data is usually represented by physical variables such as voltage, resistance, rotation.

ANALOG OUTPUT (transducer) -- Transducer output in which the amplitude is continuously proportional to the stimulus; the proportionality being limited by the resolution of the transducer; distinguished from digital output.

ANALOG-TO-DIGITAL CONVERTER (ADC) -- A device which will convert analog information to an equivalent digital code of some finite resolution. (See **digitizer, encoder and coder**.)

ANALOG VOLTAGE -- A voltage that varies in a continuous fashion in accordance with the magnitude of a measured variable.

ANCILLARY EQUIPMENT -- (See **auxiliary equipment**.)

AND -- The Boolean operator which gives a truth table value of true only when both of the variables it contacts are true.

AND CIRCUIT -- A circuit in which the phase of polarity of the output signal results from the AND function applied to the phase or polarity of the input signals.

AND GATE -- A gate whose output is energized only when every output is in its prescribed state. An AND gate performs the function of the logical AND.

ANEMOMETER -- General name for instruments designed to measure the speed or force of the wind; may be classified according to the means of transduction employed. Anemometers used in meteorology include the following types: rotation, pressure plate, pressure tube, bridled cup, contact, cooling power and sonic.

ANGLE -- 1. A difference in directions of lines which lie: (a) in a plane, giving a plane angle; (b) in a curved surface, giving a spherical angle, a spheroidal angle, etc., or (c) in two planes, measuring the inclination of one plane to the other, giving a dihedral angle. **2.** In surveying operations an angle is classified in various ways as follows: (a) according to the position or character of the surface in which it lies, e.g., horizontal angle, vertical angle, oblique angle, spherical angle, spheroidal angle; (b) according to the method by which it is obtained, e.g., observed angle, concluded angle, adjusted angle; (c) according to the function which it serves in the computation of the survey data, e.g., distance angle, azimuth angle; or (d) according to the relative position it occupies in a geometric figure, e.g., interior angle, exterior angle.

Azimuth (astronomic) -- The computed angle less than 180° between the plane of the celestial meridian and the vertical plane containing the observed object.

Azimuth (surveying) -- An angle in triangulation or in traverse through which the computation of azimuth is carried.

Deflection (surveying) -- A horizontal angle measured from the prolongation of the preceding line, right or left, to the following line.

Exterior -- **1.** The angle between any side of a polygon and adjacent side extended. **2**. Designates the four outside angles formed by a line intersecting two parallel lines.

Grad (Grade) -- An angle at the center of a circle subtended by one four-hundredth of its circumference.

Interior -- The angle formed inside a polygon by two adjacent sides.

Observed -- An angle obtained by direct instrumental observation.

ANGLE -- (continued)

Spherical -- The angle between great circles on a sphere measured by the dihedral angle of the planes of great circles or by the plane angle between tangents to great circles at their intersection.

Spheroidal -- An angle between two curves on a spheroid measured by the angle between their tangents at the point of intersection.

ANGLE INDICATOR -- A device which provides continuous measurement of the angle formed by a line from a given point on the missile to a given point on the target and a given target line (usually a target axis) containing the target point when the missile is within a predetermined distance from the target point.

ANGLE OF ATTACK -- The acute angle between a reference line fixed with respect to an airframe and the direction of the airflow relative to it. (See **apparent angle of attack**.)

ANGLE OF DEVIATION -- The angle between the path of an incident ray and the refracted ray; a measure of the refraction.

ANGLE OF YAW (YAW ANGLE) -- 1. The horizontal angular displacement of the longitudinal axis of a vehicle from the direction of its velocity; designated right or left according to the direction of bow displacement. **2.** The angle between a line in the direction of the relative wind and a plane through the longitudinal and vertical axes of an aircraft; considered positive if the nose is displaced to the right.

ANGLE MEASURING EQUIPMENT (AME) -- A device for measuring one or more angle functions between a line from its reference point to a target and a baseline or plane.

ANGULAR DISTORTION -- The failure of a lens to reproduce accurately in the image space the angle subtended (at its center of projection in the image space) by two points in the object space. One of the two points usually selected is a point on the axis of the lens or a point in the object space corresponding to the principal point in the image. (See **aberration**.)

ANGULAR VELOCITY -- The time rate of change of angular displacement, preferably in radians per second and generally designated by the Greek letter omega (Ω).

ANOMALOUS DISPERSION -- Dispersion characterized by a decrease in refractive index with increase in frequency.

ANOMALY -- 1. A deviation from a norm. **2.** In oceanography, the difference between conditions actually observed at a serial station and those that would have existed had the water been of a given arbitrary temperature and salinity. **3.** In geophysics, the difference between the theoretical or computed and actual value.

ANTENNA (radio) -- A device for converting electrical energy to space-propagating radio energy, or vice versa.

Artificial -- A device having the equivalent impedance characteristics of an antenna and the necessary power-handling capabilities, but neither radiates nor intercepts radio frequency energy; dummy antenna.

Dipole -- **1.** A straight radiator usually fed in the center and producing a maximum of radiation in the plane normal to its axis. **2.** In microwave antennas, a metal radiating structure which supports a line current distribution similar to that of a thin straight wire (a half-wavelength long) so energized that the current has two nodes (one at each of the far ends).

Helical -- An antenna used where circular polarization is required. The driven elements consist of a helix (spiral) supported above a ground plane.

Isotropic -- A hypothetical antenna radiating or receiving equally in all directions; unipole antenna (unipoles do not exist physically but represent convenient reference antennas for expressing directive properties of actual antennas).

ANTENNA FIELD -- 1. The region defined by the group of antennas. **2.** A group of antennas placed in a geometric configuration geared to a particular trajectory measuring system. **3.** The effective free-space energy distribution produced by an antenna or group of antennas.

ANTENNA GAIN -- The ratio of the maximum radiated power intensity from the subject antenna to the maximum intensity from a reference antenna with the same power input. Choosing an ideal loss-less isotropic radiator as reference allows gain to he expressed as the ratio of maximum radiated power intensity to average intensity. Unless otherwise specified, the comparison antenna is isotropic.

Dipole reference -- The power gain of an antenna in a given direction is the ratio (expressed in decibels) of the square of the field strength radiated in this direction to the square of the field strength radiated in its median plane by a perfect half-wave antenna.

ANTENNA GAIN -- (continued)

Isotropic reference -- The power gain of an antenna with respect to an isotropic source is the ratio of the maximum field intensity from the subject antenna to the field intensity front a loss-less isotropic source with the same power input.

ANTENNA PAIR -- Two antennas located on a baseline of accurately surveyed length. The signals received by these antennas are used to determine quantities related to a target position.

ANTENNA PATTERN -- A diagrammatical representation of an antenna's radiation or receiving characteristics in geometric space. The radiation or receiving characteristics are normally expressed as contours of equal gain relative to a convenient reference. In mathematical applications, the isotropic level is normally used as this reference.

ANTICYCLONE -- An extensive anticyclonic circulation; a closed circulation.

ANTICYCLONIC -- Having a sense of rotation about the local vertical opposite to that of the earth's rotation, i.e., clockwise in the Northern Hemisphere, counterclockwise in the Southern Hemisphere and undefined at the Equator.

ANTITRANSMIT SWITCH (ATR) -- A gas discharge tube located between the transmitter and the transmit switch at an odd number of quarter wave lengths from the transmit junction. Disconnects the magnetron so that it does not absorb power from the received signal.

APERTURE --

Instrument -- The opening in a camera or projector that outlines the picture area, often referred to as the framing aperture.

Open (cinetheodolite) -- A framing aperture having no glass plate.

Optical -- The clear aperture of a lens is the opening available for light rays of an axial beam transversing the lens to form an image.

Relative -- The ratio of the focal length of an optical system to the diameter of the entrance pupil. (See **stop**.)

APERTURE STOP -- The limiting optical aperture in a given optical system for a particular object distance.

APOGEE -- The high point in an orbit or trajectory. For an orbit around the earth, the point farthest from the earth; opposite of perigee.

APPARENT ANGLE OF ATTACK -- The angle between a reference line fixed with respect to an airframe and the airflow in the immediate vicinity of the angle of attack transducer.

APPARENT PITCH -- An approximation of pitch obtained from measuring the angle between the longitudinal axis of the missile and some selected reference line on one film record.

APPARENT ROLL -- An approximation of roll based on measurements from one film record only.

APPARENT YAW -- An approximation of yaw obtained from measuring the angle between the longitudinal axis of the airframe and some selected line on one film record.

ARITHMETIC OPERATION (computer) -- Any of the fundamental operations of arithmetic, e.g., the binary operations of addition, subtraction, multiplication, division, and the unitary operations of negation and absolute value.

ARITHMETIC SHIFT (computer) -- A shift of digits to the left or right within a fixed framework; a way of multiplying or dividing by a power of the given number base equivalent to the number of positions shifted.

ARITHMETIC UNIT -- That component of computer hardware where arithmetic and logical operations are performed.

ARMATURE -- 1. The member in certain transducers which is displaced by the collected forces in the force-summing element and which, in turn, acts on elements whose electrical characteristics are a function of stimulus.
2. The component which completes the magnetic path in E-core inductive coils.

ASA SPEED INDEX -- An index published by the American Standard Association (ASA) to rate the relative speed of photographic materials; similar to the Weston and General Electric systems of expressing speed in that the step increment is the cube root of 2.

ASKANIA -- Cinetheodolites or other optical instruments manufactured by the company of the same name.

ASPECT ANGLE (α) -- The angle between the negative roll axis and the slant range vector.

ASSEMBLE -- To translate a routine written in a synthetic machine language into absolute machine instructions and to assign machine storage for those instructions and data.

ASSEMBLER -- A computer program which operates upon symbolic input to produce machine instructions to carry out some or all of the following functions: **a.** Translation of symbolic operation codes; **b.** Allocation of storage, at least to the extent of assigning storage locations to successive instructions and using symbolic addresses so defined; **c.** Computation of absolute or relocatable address from symbolic addresses; **d.** Generation of sequences of symbolic instructions by the insertion of parameters supplied for each case into macro definitions; and **e.** Insertion of library routines. Differs from compiler chiefly in that it does not make use of information on the overall logical structure of the program, but evaluates each symbolic instruction as though it stood alone or in the immediate context of a few preceding instructions.

ASSEMBLY ROUTINE -- A computer routine which assembles other routines.

ASSIGNMENT -- (See **frequency assignment**.)

ASTRODOME -- A rigid hemispherical structure used to cover large tracking instruments to protect them from the elements, usually constructed so the dome rotates with the instrument.

ASTRONOMICAL REFRACTION ERROR -- The difference between the observed and true angular positions of an astronomical object caused by the atmosphere. An astronomical object is one that is at an effectively infinite distance. Astronomical refraction error is numerically equal to the total bending of a ray in passing through the atmosphere to the observer. Often called, simply, astronomical refraction.

ASTRONOMICAL TRIANGLE -- The triangle on the celestial sphere formed by the arcs of great circles connecting the celestial pole, the zenith and a celestial object. The angles of the astronomical triangle are: at the pole, the hour angle; at the celestial object, the parallactic angle; and at the zenith, the azimuth angle. The sides are: pole to zenith, the coaltitude; zenith to celestial object, the zenith distance; and celestial object to pole, the polar distance.

ASYMMETRY OF OBJECT (target) -- Lack of symmetry in the visible aspect of an object as seen from a particular point of observation. A square or rectangular pole may so face the observer that the line bisecting its observed tangents does not pass through its geometrical center. With a square cupola or tower, the error resulting from observing tangents and taking a mean may be

ASYMMETRY OF OBJECT (target) -- (continued)

quite large. The error due to asymmetry of object observed is of the same character and requires the same treatment as error due to observing an eccentric object. It is the phase error, or portion thereof, which is due to asymmetry of orientation.

ASYNCHRONOUS COMPUTER -- A computer in which the execution of one operation is dependent on a signal that the previous operation has been completed, rather than on a fixed time cycle.

ASYNCHRONOUS DATA -- Information which is sampled at irregular intervals with respect to another operation.

ASYNCHRONOUS MACHINE -- A machine whose speed of operation is not related to any frequency in the system to which it is connected.

ATMOSPHERE -- The envelope of air surrounding the earth and bound to it more or less permanently by the earth's gravitational attraction; the system whose chemical properties, dynamic motions, and physical processes constitute the subject matter of meteorology. The earth's atmosphere extends from the solid or liquid surface of the earth to an indefinite height, its density asymptotically approaching that of interplanetary space. At heights of the order of 80 km (50 mi) the atmosphere is barely dense enough to scatter sunlight to a visible degree. At heights of the order of 600 km (370 mi) the atmosphere's density becomes so low that the properties typical of a gas cease to exist, and the free molecular paths are long enough that one must consider them as portions of elliptical orbits in the earth's gravitational field. At 1000 km (600 mi) the density of the atmosphere is still sufficient to yield readily observable auroral effects. At about 30,000 km (18,600 mi) above the earth's surface, a molecule moving as if in rigid rotation with the earth could not be held to such an orbit by the earth's gravitational attraction, so this freight might be taken as an extreme upper limit of the possible atmosphere. The atmosphere may be subdivided vertically into a number of atmospheric shells, but the most common basic subdivision is that which recognizes a troposphere from the surface to about 10 km. a stratosphere from about 10 km to about 80 km, and an ionosphere above 80 km; and each of these is often further subdivided. Because the tropopause contains the bulk (about three-fourths) of the atmospheric mass and because it contains virtually all of the atmospheric water vapor, ordinary weather events are most intimately concerned with tropospheric phenomena.

ATMOSPHERIC PRESSURE -- At a given point, the stress produced by gravitational attraction on the air molecules and exerted by the atmosphere uniformly in all directions from that point. This stress is normally visualized as

a vertical column of air above the point whose load balances a certain column of mercury. Pressure is expressed as the height (in millimeters or inches) of the column of mercury or as millibars.

ATMOSPHERIC SHELL -- Any one of a number of strata or layers of the earth's atmosphere; atmospheric layer, atmospheric region. Temperature distribution is the most common criterion used for denoting the various shells. The troposphere (the region of change) is the lowest 10 or 20 km of the atmosphere and is characterized by decreasing temperature with height. The term stratosphere is used to denote the relatively isothermal region immediately above the tropopause and the shell extending upward from the tropopause to the maxim temperature level at 50 to 55 km. The mesosphere is the shell between about 50 or 55 and 70 or 80 km. The thermosphere is the shell above the mesopause with a more or less steadily increasing temperature with height. The distribution of various physical-chemical processes is another criterion. The ozonosphere, lying roughly between 10 and 50 km, is the general region of the upper atmosphere in which there is an appreciable ozone concentration which plays an important part in the radiative balance of the atmosphere. The ionosphere, starting at about 70 or 80 km, is the region in which ionization of one or more of the atmospheric constituents is significant. The neutrosphere is the shell below this which is, by contrast, relatively unionized. The chemosphere (with no very definite height limits) is the region in which photochemical reactions take place. Dynamic and kinetic processes are a third criterion. The exosphere is the region at the top of the atmosphere (above the critical level of escape) in which atmospheric particles can move in free orbits, subject only to the earth's gravitation. Composition is a fourth criterion. The homosphere is the shell in which there is so little photodissociation or gravitational separation that the mean molecular weight of the atmosphere is sensibly constant. The heterosphere is the region above this, where the atmospheric composition and mean molecular weight are not constant. The boundary between the two is probably at the level at which molecular oxygen begins to be dissociated (in the vicinity of 80 or 90 km). The term mesosphere has been given another definition which appears less logical, i.e., the shell between the exosphere and the ionosphere. This use of the word mesosphere has not been widely accepted.

ATTENUATION -- 1. In physics, any process in which the flux density, power, amplitude, intensity, illuminance, etc. of a "parallel beam" of energy decreases with increasing distance from the energy source. Attenuation is always due to action of the transmitting medium itself. It should not be applied to the divergence of flux due to distance alone as described by the inverse-square law. **2.** The reduction in sound or light intensity caused by the absorption and scattering of sound or light energy in air or water. **3.** A lessening of the amplitude of a wave with distance from the origin. **4.** The decrease in submarine motion with increasing depth. Submarine motion resulting from surface waves

attenuates rapidly with depth and practically disappears at a depth equal to a surface wavelength. **5.** In geophysics, the depletion of electromagnetic energy (solar radiation, radio waves, radar waves, etc.) which is affected by the earth's atmosphere and its constituents.

ATTITUDE ERROR (transducer) -- An error due to orientation of the transducer.

ATTITUDE INDICATOR -- Provides the missile look angle at the instant of fuse activation.

AUDIO FREQUENCIES -- Those frequencies within the audible spectrum.

AUGMENTED LAUNCH STATION -- A launch station with facilities for launching two or more missiles.

AUTHORIZED CARRIER FREQUENCY -- A specific authorized carrier frequency from which the actual carrier frequency is permitted to deviate by an amount not to exceed the frequency tolerance.

AUTO BEACON -- An automatic mode of tracking an object by transmitted energy from the ground to a vehicle's onboard beacon.

AUTOMATIC CHECK -- 1. An automatic test built into a computer. **2.** An automatic indication arising from the failure of the computer to verify a test built into the hardware, e.g., divide check, tape check, etc.

AUTOMATIC CODING -- A technique by which a machine translates a routine written in a synthetic language into coded machine instructions, e.g., assembling.

AUTOMATIC ELECTRONIC DATA SWITCHING CENTER -- A communication center designed specifically for relaying digitized data by automatic electronic methods.

AUTOMATIC EXCHANGE -- A communication exchange which is affected by devices set in operation by the originating subscriber's instrument and not through the intervention of an operator.

AUTOMATIC PROGRAMMING -- A technique by which a machine converts the definition of the procedure for solving a problem into a series of ordered procedures and operations which can be automatically coded.

AUTOMATIC ZERO AND FULL-SCALE CALIBRATION CORRECTION -- Zero and sensitivity by electronic servos which continuously compare

demodulated zero and full-scale signals with zero and full-scale reference voltages.

AUTOMATION -- The investigation, design, development and application of methods for rendering or making processes or machines self-acting or self-moving; rendering automatic.

AUXILIARY EQUIPMENT (computer) -- Equipment not under direct control of the central processing unit; ancillary equipment.

AVAILABLE MACHINE TIME -- That time when a computer with power turned on is known or believed to be operating correctly and is not undergoing maintenance.

AXIS --

Celestial -- The axis of the standard celestial sphere (the earth's axis of rotation extended indefinitely).

Geometrical (lens) -- The actual, physical axis formed with reference to the edge perimeter of a lens or lenses.

Lens -- Any straight line passing through the optical center of a lens. That axis which also passes through the center of curvature is termed the principal axis or optical axis (any other is referred to as a secondary axis).

Optical (lens) -- The imaginary reference line which, as a light ray, , passes underrated through the lens nodal points. (See **concentricity**.)

Optical (system) -- The straight line produced by the axes of the individual components in a properly aligned system. The center of the image pattern in a theodolite (not necessarily the mechanical center of the lenses).

Pitch -- A line through the vehicle's nominal center of gravity perpendicular to both the roll and yaw axes (also called the "lateral" axis). Forms the third coordinate of the vehicle's orthogonal coordinate system.

Roll, positive -- A line from the vehicle's nominal center of gravity through a fixed arbitrarily defined point on the leading end or nose. Ordinarily identical with the longitudinal axis.

Yaw -- A fixed cross-sectional line through a vehicle's nominal center of gravity normal to the pitch and roll axes.

AXIS WOBBLE -- 1. Variability in attitude of an axis. **2.** The random and periodic deviation in magnitude and direction of an axis from its mean deviation.

AZIMUTH -- The horizontal angle measured clockwise positive from a reference pole, as seen from above.

Geodetic -- For the geodetic line from A to B, the angle between the tangent to the meridian at A and the tangent to the geodetic line at A. In the U.S. Coast and Geodetic Survey, this angle is measured clockwise from south. This azimuth is called the forward azimuth for the line AB. The angle between the tangents to the meridian and to the geodetic line at B is called the back azimuth for the line AB. Because of the convergence of the meridians, the forward and backward azimuths of a line do not differ exactly by 180°, except where the two end points have the same geodetic longitude or where the geodetic latitudes of both points are 0°. The geodetic line is not, except in special cases, a plane curve. For short lines (of the length commonly used in triangulation) one may neglect the small difference between the geodetic line and the plane curve actually observed.

Grid -- The angle in the plane of projection between a straight line and the central meridian of a plane-rectangular coordinate system.

LaPlace -- A geodetic azimuth derived from an astronomic azimuth by means of the LaPlace Equation.

AZUSA -- A short-baseline, continuous-wave, phase-comparison, electronic C-band tracking system. A single station is used to provide two direction cosines and slant range to determine the position of the object being tracked.

B

BACK FOCAL LENGTH -- The distance from the back vertex of a lens to its back focus.

BACK FOCUS -- The principal focal point in the image space.

BACKING --

Meteorological -- **1.** In general, internationally accepted usage: a change in wind direction in a counterclockwise sense (south to southeast to east) in either hemisphere; the opposite of veering. **2.** Common usage among United States meteorologists: a change in wind direction in a counterclockwise sense in the Northern Hemisphere; the opposite of veering.

Photographic -- A light absorbing layer on the back of film plates to prevent halation (a halo or ghost around the image).

BACKSCATTER -- The portion of the electromagnetic energy emitted from a source that is returned toward the source because of encounters with atmospheric particulates and other objects. (See **scatter**.)

BACKSIGHT (leveling) -- A reading on a rod (held on a point whose elevation has been previously determined) which is not the closing sight of a level circuit.

BALANCED CIRCUITS -- Those consisting of two signal branches in the presence of ground or a neutral branch capable of being operated so that the voltage of the two branches at all transverse planes is equal in magnitude and opposite in polarity with respect to ground or the neutral branch.

BALANCED LINE -- A transmission line consisting of two conductors in the presence of ground, capable of being operated so that the voltages at all transverse planes are equal in magnitude and opposite in polarity with respect to ground and whose currents are equal in magnitude and opposite in direction.

BALLISTIC FLIGHT -- A missile flight path determined by launch angles, missile velocity, gravity, and aerodynamic drag.

BALLOON -- A lighter-than-air unpowered aircraft. May be fabricated from extensible or nonextensible film or fabric.

BALLOON -- (continued)

Free -- An unmanned balloon whose ascent and descent may be controlled by use of ballast or by a gas valve in the envelope and whose flight direction is determined by the wind.

Moored -- A balloon that is attached to the ground by a rope or cable; ascent or descent is controlled from the ground by adjusting the length of the attached rope or cable.

Sounding -- A free, unmanned balloon instrumented for upper air observations. (See **sounding, meteorological**.)

BANDPASS -- The number of cycles per second expressing the difference between the limiting frequencies at which the attenuation to single frequency energy is the desired amount (usually half power or 3 dB).

BANDPASS RESPONSE -- The uniform transmission of a hand of frequencies.

BANDWIDTH -- 1. The difference between the two limiting frequencies of a band.

2. Bandwidth $(b) = \int_{f^1}^{f^2} \frac{A^2(f)df}{A^2}$

The amplitude response of a receiver normalized with respect to the average or mean-square value $\overline{A}^2$. Taken for convenience between frequency points(f^1 and f^2) where the power response is one-half its maximum value or when

$$A_f = \frac{\sqrt{2 \quad A}}{2}$$

maximum, i.e., the 3-dB points. **3.** The minimum value of the occupied bandwidth sufficient to insure the transmission of information at the rate and with the quality required for the system employed, under specified conditions. **4.** The smallest continuous frequency interval outside of which the amplitude of the spectrum does not exceed a prescribed fraction of the amplitude at a specified frequency.

BANDWIDTH OCCUPIED BY AN EMISSION -- (See **occupied bandwidth**.)

BAR-GRAPH MONITORING OSCILLOSCOPE -- A device used to observe commutated signals which appear as a series of bars with lengths proportional to channel modulation. The same oscilloscope is commonly used for setup and troubleshooting observations.

BARKER CODE -- A binary code suitable for Pulse Code Modulation (PCM) frame synchronization; has near optimal correlation properties and when decoded is immune to phase displacement by random pulses immediately adjacent to the pattern and to phase displacement by error in the transmitter code. The Barker Codes are 3-bit, 110; 7-bit, 1110010; 11-bit, 11100010010.

BAROMETER -- An instrument for measuring atmospheric pressure. Two types commonly used in meteorology are the mercury barometer and the aneroid barometer.

BAROSWITCH -- A pressure-operated switching device used in a radiosonde; barometric switch. An aneroid capsule enlarges and causes an electrical contact to scan a radiosonde commutator composed of conductors separated by insulators. Each switching operation corresponds to a particular pressure level. The contact of an insulator or a conductor determines whether temperature, humidity or reference signals will be transmitted.

BASE -- 1. The radix (root)of a number system. **2.** The substance supporting a photographic emulsion.

BASELINE --

Electronic trajectory -- A straight line of known orientation which connects two or more accurately spaced antennas or antenna fields in a trajectory measuring system.

Meteorological -- The reference line in a triangulation measurement. In meteorological observations, the term has several applications, for example: the horizontal distance from the observation point to the location of a ceiling-light projector; the horizontal distance between a ceilometer projector and detector; and the bearing, distance, and slope of the line between the observational points in a double-theodolite observation.

Radar -- The line traced on amplitude-modulated indicators which corresponds to the power level of the weakest echo detected by the radar. Although traced with every pulse transmitted by the radar, it appears as a nearly continuous display on the scope. Target signals slow up as perpendicular deviations from the baseline. range is measured along the baseline, signal strength is indicated by the magnitude of the deviations, and the type of target usually can be determined by the appearance of the deviations.

BASELINE --(continued)

Triangulation -- The side of one of a series of connected triangles, the length of which is measured with prescribed accuracy and precision, and from which the lengths of the other triangle sides are computed. Baselines in triangulation are classified according to the character of the work they are intended to control, and the instruments and methods used in their measurement are such that prescribed probable errors for each class are not exceeded. The probable errors, expressed in terms of the lengths, are as follows: First-order class I, II, III, and second-order class I baselines: 1/1,000,000; second-order class II baseline: 1/500,000; third-order baseline: 1/250,000.

BASELINE CHECK -- (See **ground check**.)

BASE TAPE -- A tape or band of metal or alloy designed and graduated and precisely calibrated for measuring the lengths of baselines for controlling triangulation, and for measuring the lengths of first- and second-order traverse lines.

BASE-TIMING SEQUENCE -- The control of the time-sharing of a single transponder between several ground transmitters through the use of suitable coded base-timing signals.

BATCH PROCESSING (computer) -- The processing of a task under the direction and control of a prestored command sequence; accumulating a number of tasks requiring the same computer.

BAUD -- A unit of signaling speed; the number of code elements per second. Term used to define the operating speed of a printing telegram system (the total number of mark-and-space [on-and-off] code elements per second). A teleprinter running at such a speed that the maximum line frequency 22.5 Hz is said to be operating at 45 bauds.

BEACON -- 1. Electronic equipment (usually installed in an airborne vehicle) which emits a radio signal at 'a fixed sequence or in response to an interrogating signal. **2.** A nondirectional device containing an automatic receiver and transmitter, which receives a signal and transmits a similar signal or set of signals. (See **racon** and **transponder**.)

BEACON (continued)

Chain radar -- A beacon with a very fast recovery time. This recovery time provides the possibility of simultaneously interrogating and tracking the beacon by as many radars as required so long as they are phased, synchronized, or the total Pulse Repetition Frequency (PRF) does not exceed the maximum PRF characteristics of the beacon.

Telemetry -- A system whereby two or more reply pulses are transmitted by the beacon for relay of data from the test vehicle to the ground station.

BEACON COUNTDOWN -- The reliability of a beacon determined by measuring the percentage difference between the number of interrogation pulses and beacon return pulses with a counter.

BEACON DELAY -- The time between the arrival of a signal and the response of the beacon. In a pulse beacon, delay is ordinarily measured between the leading -3-dB points of the triggering pulse and the reply pulse.

BEACON SHARING -- Interrogation of the capsule beacons by more than one radar simultaneously.

BEACON SKIPPING -- A term used to describe a condition where beacon-return pulses are missing at the interrogating radar. Beacon skipping can be caused by interference, over-interrogation, antenna nulls or pattern minima.

BEACON STEALING -- Loss of beacon tracking by a radar due to interfering interrogation signals from another radar.

BEACON TIME-SHARING -- A technique by which two or more radars may, interrogate and track a long-recovery type beacon without exceeding the duty cycle of the beacon. This is accomplished by properly sequencing the various radar interrogations. In addition, it is necessary to ensure that the total time of the interrogations does not exceed the beacon duty cycle and that enough time is allowed for the modulator section of the beacon to recover before it receives the next interrogation.

BEAM CROSSOVER -- The point of overlap of a beam from an antenna that is nutated or rotated about the centerline of the antenna radiation direction. The crossover point is normally at the .7 power point. The received energy, when commutated into four quadrants, provides the information necessary for the servo-amplifier error signal to align the antenna to a target.

BEAM RIDING -- A condition wherein the missile is fired into a beam transmitted by a guidance radar and when captured performs in accordance with beam intelligence.

BEAM WIDTH -- The width in degrees or mils of an antenna beam measured at the 3-dB (112) power points.

BEARING, GRID -- The angle in the plane of the projection between a line and a north-south grid line.

BEARING OF A LINE (plane surveying) -- The horizontal angle a line makes with the meridian of reference adjacent to the quadrant in which the line lies. Bearings are classified as true bearings, magnetic bearings and grid bearings according to the meridian used. A bearing is identified by naming the end of the meridian (north or south) from which it is reckoned and the direction (east or west) of that reckoning. Thus, a line in the northeast quadrant making an angle of 50° with the meridian will have a bearing of N 50° E. In most survey work, it is preferable to use azimuth rather than bearings.

BEARING, TRUE -- The horizontal angle between the meridian line and a line on the earth. The term true bearing is used in many of the early descriptions of land boundaries in this country. It is associated with true north, referring to the direction of the north point as determined by astronomical observations. If an astronomically determined bearing is used, the term astronomic bearing is preferred over true bearing.

BEAT -- The periodic variation that results from the superposition of two simple harmonic oscillations whose frequencies differ by a small amount. Involves a periodic increase and decrease of amplitude at the beat frequency equal to the difference in the frequencies of the two parent signals. Thus, if two pure tones having frequencies of 300 and 400 Hz are heard, the listener will also sense a frequency equal to the difference (100 Hz); this is the beat frequency.

BEAT-BEAT DOVAP -- (See **DOVAP ELSSE**.)

BEATS -- Periodic variations in wave amplitude produced by interference of wave trains having different frequencies.

BEL -- A dimensionless unit for expressing the ratio of two values of power (the number of bels being the logarithm to the base 10 of the power ratio). With P_1 and P_2 designating two amounts of power and N the number of bels corresponding to the ratio P_1/P_2, $N=\log_{10}(P_1/P_2)$.

BELLOWS -- A force-summing member used in certain pressure transducers.

BENCH MARK -- A relatively permanent natural or artificial object bearing a marked point whose elevation above or below an adopted datum is known.

BENCH MARK, TIDAL -- A bench mark set to reference a tide staff at a tidal station, the elevation of which is determined with relation to the local tidal datum.

BEND -- The use of a prism or a mirror to cause a change of direction in an optical axis.

BEST-FIT STRAIGHT LINE -- 1. That straight line which most nearly conforms to a set of data points in accordance with predetermined criteria and conditions. **2.** A line chosen to represent the sensitivity of a transducer, and from which nonlinearity errors may be calculated. The line is chosen so that the response curve contains a minimum of three points of equal and maximum deviation from the line.

BEST-FIT STRAIGHT LINE WITH FORCED ZERO -- The line from which zero-based linearity is calculated.

BETA (β) (wave theory) -- The angle between the polarization direction of a linearly polarized wave and the polarization direction of a linearly polarized receiving antenna.

BIAS (recording) -- Application of a high-frequency biasing voltage for improved, distortion-free recording.

BIAS SET FREQUENCY -- In direct magnetic tape recording, a specified recording frequency employed during the adjustment of bias level for optimum record performance (not the frequency of the bias).

BINARY CODE -- A representation of information by a configuration of binary bits according to specific rules of correspondence. The bits may be represented by pulses of varying duration, spacing or amplitude, or by one of two distinct levels of voltage in a logic circuit. A code composed of a combination of bits, each of which must assume one of two distinct states.

BINARY CODED CHARACTER -- One element of a notation system for representing alphanumeric characters such as decimal digits, alphabetic letters, punctuation marks, etc., by a fixed number of consecutive binary digits.

BINARY CODED DECIMAL -- A number-representation system in which each of the decimal digits of a number is expressed by a binary code.

BINARY CODED DIGIT-- One element of a notation system for representing a decimal digit by a fixed number of binary positions.

BINARY CODED INFORMATION -- (See **binary coded decimal**.)

BINARY DIGIT -- A digit or mark in the binary number system, i.e., either 0 or 1. (See **bit**.)

BINARY NUMBER SYSTEM -- A number system using the equivalent of the decimal integer 2 as a base.

BINARY POINT -- That point in a binary number which separates the integral from the fractional part. Analogous to the decimal point for a decimal number.

BINARY-TO-DECIMAL CONVERSION -- Conversion of binary number to the equivalent decimal number, i.e., a base 2 number to a base 10 number.

BIQUINARY -- A two-part representation of a decimal digit consisting of a binary portion with values of 0 or 5 and a quinary portion with values 0 to 4; e.g., the number 7 is coded as 12 which implies 5+2.

BIT -- 1. Contraction of binary digit; may be only 0 or 1. **2.** An information theory: equal to one binary decision of the designation of one or two possible and equally likely values or states of anything used to store or convey information.

BIT COMBINATION -- (See **bit pattern**.)

BIT DENSITY -- A measure of the number of bits recorded per unit of length or area.

BIT PATTERN -- A combination of n binary digits to represent 2^n possible choices; e.g., a 3-bit pattern represents eight possible combinations.

BIT RATE -- The speed at which bits are transmitted.

BIVANE -- A bi-directional wind vane; a sensitive wind vane used in turbulence studies to obtain a record of the horizontal and vertical components of the wind. The instrument consists of two lightweight airfoil sections mounted orthogonally on the end of a counterbalanced rod which is free to rotate in the horizontal and vertical planes. The positions of the rod may be recorded by electrical techniques.

BLACK BOX -- 1. A generic term used to describe a device which performs a special function or in which known inputs produce known outputs in a fixed relationship. **2.** A term used loosely in missilery to refer to any electronic

subcomponent that is equipped with "connects" and "disconnects" so that it can be readily inserted or removed from a specified place in a larger system without knowledge of its detailed internal structure.

BLANK (computer) -- A machine character to denote the presence of no information rather than the absence of information.

BLANKING LEVEL -- Level of multiplexed signal between channel pulses.

BLIP -- (See **pip**.)

BLOCK (computer) -- A group of records, words or characters handled as one unit.

BLOCKING (meteorological) -- The large-scale obstructing of the normal west-to-east progress of migratory cyclones and anticyclones. A blocking situation is attended by pronounced meridional flow in the upper levels, often comprising one or more closed anyticyclonic circulations at high latitudes and cyclonic circulations at low latitudes (cutoff highs and cutoff lows). This anomalous circulation pattern (the block) typically remains nearly stationary or moves slowly westward, and persists for a week or more.

BLOCK INTERVAL (ballistic camera) -- That portion of the operation cycle of a capping shutter where a photographic exposure may not occur.

BLOCK LENGTH (computer) -- The total number of records, words or characters contained in one block.

BODY ANGLE -- The angle the longitudinal axis of an airframe makes with some selected line.

BONDED STRAIN GAGE -- One or more strain-sensitive elements bonded to a surface; used to measure applied stresses.

BONDED TRANSDUCER -- A transducer which employs the bonded strain gage principle of transduction; bonded pickup.

BOOLEAN ALGEBRA -- An algebra named for George Boole; similar in form to ordinary algebra but with classes, propositions, on-off circuit elements, etc., for variables rather than data values. Includes the operators and, or, not, if, then, nor, nand, etc.

BORESIGHT -- (See collimation.)

BORESIGHT CAMERA -- A camera used for obtaining tracking-error information, usually attached near the center of a radar dish.

BORESIGHT TARGET -- A target located by a survey at a known azimuth, elevation and distance from a radar or camera; used for collimation and orientation of the radar antenna system or the camera.

BOUNDED AREA -- (See **flight test area**.)

BOWIE EFFECT (gravity) -- The indirect effect on gravity due to the warping of the geoid, or the elevation of the geoid with respect to the spheroid of reference. Also known as the Bruns term, the Bowie effect was discussed by Stokes, Bruns, Clarke, Helmert, and others, but it was under the direction of Bowie that a practical means was provided for computing its value for a given station. The correction for the Bowie effect is applied to the theoretical value of gravity, with the sign reversed. Values of the Bowie effect are tabulated in the fundamental tables: deformation of the geoid and its effect on gravity. The symbol Δ_{2g} has been used to represent the Bowie effect.

BRANCH (computer) -- The point in a programming routine where a decision is made to proceed along one of two or more selected paths.

BREAKDOWN VOLTAGE RATING -- The dc or sinusoidal ac voltage stated in a specification which can be applied across preselected insulated portions of a transducer without causing arcing or conduction above a particular current value across the insulating material. Time duration of application, ambient conditions, and ac frequency must be identified.

BRIDGE RESISTANCE (transducer) -- The resistance of each element of a transducer whose configuration is that of an equal-arm Wheatstone bridge; also, the output resistance of this bridge.

BROAD OCEAN AREA (BOA) -- A large, deep ocean area instrumented by a Missile Impact Location System (MILS) network using Sound Fixing and Ranging (SOFAR) principles to geographically locate an underwater explosion.

BROKEN (meteorology) -- Descriptive of a sky cover of from 0.6 to 0.9 (to the nearest tenth) and applied only when clouds or obscuring phenomena aloft are present (not when the sky cover is composed entirely of surface-based obscuring phenomena). In aviation weather observations, a broken sky cover is denoted by the symbol  ; and may be explicitly identified as thin (predominantly transparent); otherwise, a predominantly opaque status is implicit. An opaque broken sky cover is the minimum requirement for a ceiling (frequently termed broken ceiling).

BUCKLE -- To jam film in a motion picture camera due to improper threading, damaged perforations or defective mechanism.

BUFFER -- 1. A word which often implies buffer storage. **2.** An isolating circuit used to avoid any reaction of a driven circuit upon the corresponding driving circuit.

BUFFER AMPLIFIER -- An amplifier used to isolate the output of any device (oscillator) from the effects produced by changes in load from subsequent circuits.

BULK ERASE -- A procedure whereby an entire reel of tape is put through an erasing cycle as opposed to an erase head which erases only that portion of the tape passing by the head.

BUNDLE (parallel collimated light) -- The light rays surrounding the chief ray forming a point image.

B-UNIT -- (See **refractivity**.)

BURST (ECM) -- 1. An unclassified brevity code word signifying chaff drops occurring at sufficient intervals to appear on a radar scope as individual target returns. **2.** Single chaff drops of not more than 3 seconds duration, spaced not less than 90 seconds apart, with not more than four bursts occurring within a 40-nautical mile radius of other chaff drops.

BURST DISTANCE -- Distance between the point of detonation and the target.

BURST PRESSURE (transducer) -- The pressure at which the housing or sensing element of a pressure transducer fails to support the associated stresses resulting in a rupture or leak.

BUS -- A path over which information or energy is transferred, e.g., an electrical conductor or line.

BYTE (computer) -- A generic term used to indicate an easily manipulated portion of consecutive binary digits, e.g., an 8- or 6-bit byte.

C

CALIBRATED FOCAL LENGTH -- An adjusted value of the equivalent focal length of an optical system such that the effect of lens distortion is distributed over the effective field of view, according to some established criteria.

CALIBRATION CURVE (transducer) -- A record of the measured relationship of a transducer output to the applied measurand over the transducer range.

CALIBRATION CYCLE (transducer) -- The application of known values-.; or measurand and subsequent recording of corresponding output readings over the range of a transducer in an ascending and then descending direction.

CALIBRATION INTERVAL (transducer) -- The time between routine periodic transducer calibrations.

CALIBRATION, PRIMARY (transducer) -- Calibration in which the transducer output is observed or recorded while a direct stimulus is applied under controlled conditions.

CALIBRATION RECORD (transducer) -- A record (table, graph or magnetic tape) of the measured relationship of the transducer output to the applied measurand over the transducer range.

CALLING SEQUENCE (computer) -- The instructions for linking a closed routine with a main routine, i.e., basic linkage and a list of the parameters.

CALL NUMBER (computer) -- The identification for a closed routine. (See **calling sequence**.)

CALM (meteorological) -- The absence of apparent air motion. For the Beaufort wind scale, this condition is reported when smoke is observed to rise vertically or the surface of the sea is smooth and mirror like. In United States weather-observing practice, the wind is reported as calm when clocked at a speed of less than 1 mile per hour (or 1 knot).

CAMERA --

Ballistic -- A photogrammetric camera capable of being rigidly oriented so that a succession of exposures (usually on a single emulsion) may each be referenced to the same elements of outer orientation. In ballistic measurements, denotes instruments ranging from a simple camera to a highly precise phototheodolite.

CAMERA -- (continued)

Bowen -- A fixed ribbon frame camera which uses a revolving drum shutter and a precision three-axis mount for orientation purposes; used mainly for acceleration data (sometimes called “Bowen-Knapp").

Pulsed -- A camera that uses a pulse to initiate each exposure.

CAMERA AXIS -- 1. In a single-lens camera, the photograph perpendicular to the center of the picture. **2.** In a multiple lens camera, the photograph perpendicular to the central perspective unit or the photograph perpendicular to the transformed photograph. (See **axis, optical**.)

CAMERA CALIBRATION -- The determination of the calibrated focal length, the location of the principal point with respect to the fiducial marks, and the lens distortion effective in the focal plane of the camera and referred to the particular calibrated focal length.

CAPPING OPERATION (ballistic camera) -- Exists whenever a capping shutter effectively blocks or passes a potential exposure derived from or created by another shutter.

CAPPING SHUTTER -- An auxiliary shutter used for controlling the frequency rate of successive exposures without affecting the photographic exposure duration.

CAPTIVE MISSION -- One in which an air launched missile is carried aloft for checks without the intent of launching it.

CAPTURE EFFECT -- Occurs in FM reception when the stronger signal of two stations completely suppresses the weaker signal.

CARD CODE (computer) -- Combinations of punched holes which represent characters (letters, digits, etc.) on a punched card.

CARD COLUMN -- One of the vertical lines of punching positions on a punched card.

CARD FIELD -- A fixed number of consecutive card columns assigned to a unit of information; e.g., card columns 15-20 can be assigned to identification.

CARD PUNCH -- A device for recording information on cards by punching holes to represent letters, digits and special characters.

CARD READER -- A device which senses and translates the holes in punched cards.

CARD ROW -- One of the horizontal lines of punching positions on a punched card.

CARD TO TAPE -- A term pertaining to equipment which transfers information directly from punched Cards to punched or magnetic tape.

CARDINAL -- The astronomical directions (north, south, east, west) on the surface of the earth. Without qualifications, sometimes indicates any or all of the these directions.

CARRIER -- An electrical wave modulated to transmit intelligence; usually a sinusoidal wave. The modulation represents the information.

CARRIER CONTROL -- Control affected by the presence or absence of an RF carrier.

CARRIER SUPPRESSION -- A method of operation in which the carrier wave is not transmitted.

CARRIER SYSTEM -- A means of obtaining a number of channels over a single path by modulating each channel upon a different carrier frequency and demodulating at the receiving point to restore the signals to their original form.

CARRIER-TO-NOISE RATIO -- The ratio of the value of the carrier to that of the noise after selection and before any nonlinear process such as amplitude limiting and detection.

CARRY (computer) -- 1. A digit, bit or signal advanced to the next higher position as a result of an operation. **2.** To advance the digit, bit or signal from a lower position to a higher position.

CASE PRESSURE (transducer) -- The difference between the pressure in the transducer case and ambient pressure.

CATADIOPTRIC -- Optical systems combining refractive and reflective elements.

CAUTION PERIOD (safety) -- The time during which a hazardous condition exists, but the risk level does not rule out exposure of personnel.

CAVITY RESONATOR -- A space totally enclosed by a metallic conductor and excited in such a way that it becomes a source of electromagnetic oscillations.

The size of the enclosure determines the resonant frequency. For a cylinder, the maximum resonant wavelength is 2.61 times the radius.

CEASE FIRE (safety) -- The complete stoppage of an operation which results in rescheduling the test.

CEILOMETER -- An automatic, recording, cloud-height indicator comprised of three components: the projector which directs vertically an intense, modulated beam of light (fixed-beam ceilometer only); the detector, the photoelectric cell pickup (located a known distance from the projector) which scans continuously in a vertical plane to detect the illuminated spot on the cloud; and the recorder which contains an amplifier tuned to the frequency of the modulated beam to discriminate against extraneous light. In the rotating beam ceilometer, the projector turns rapidly through 360° while the detector is fixed vertically.

CELSIUS TEMPERATURE SCALE (°C) -- Same as centigrade temperature scale. The Ninth General Conference on Weights and Measures (1948) replaced the designation "degree Centigrade" by "degree Celsius". On the Celsius scale, the boiling point of water is 100° and the freezing point is 0°.

CELL (computer) -- Storage for one unit of information, usually one character or one machine word. More specific terms (column, location, block) are preferable, since there is little uniformity in the use of the term "cell."

CENTER FREQUENCY -- The assigned carrier frequency of a radio transmitter station; the resting frequency.

CENTER OF GRAVITY -- A point at which the mass of the entire body may be regarded as being concentrated; also called "center of mass."

CENTER OF SEISMIC MASS (transducer) -- The point in the seismic mass where acceleration and/or gravitational forces are summed; provides the reference from which the radius is determined when calculating or applying linear acceleration levels generated by a centrifuge. Often determined empirically by spinning the accelerometer in the center of a centrifuge and observing the position of the instrument when its output is equivalent to zero acceleration.

CHAFF (ECM) -- Reflectors made of thin narrow metallic strips of various lengths; used to execute radar echoes and thereby confuse enemy radars.

CHAINING -- The operation of measuring a distance on the earth with a chain or metal tape. The chain once used in making land and other surveys has been

replaced by the metal tape; the term "chaining" has continued in use when reference is made to surveys of the public lands of the United States. For the corresponding operation in other surveys, the term "taping" is preferred. In chaining, those who mark the tape ends are called "chainmen".

CHAIN PRINTER -- A high-speed printer in which the type slugs are carried by the links of a revolving chain,

CHAIN RADAR SYSTEM -- One comprised of a number of radars or radar stations located at various sites along a missile-flight path linked together by data and communication lines for target acquisition, target positioning and/or data recording purposes. The target acquisition link makes it possible for any radar to position any other radar on target.

CHANNEL -- 1. The path required to convey intelligence. **2.** In digital computers: (a) a path along which a series of digits, characters or units of information may flow or be stored (for example, information in the form of punch cards may flow in either one of two card channels which do not physically connect); (b) a device which connects input-output units to the main part of the computer or to each other; (c) a path parallel to the edge of magnetic tapes or drums along which information may be stored by means of the presence or absence of polarized spots (singly or in sets) (See **track**); and (d) delay line memory such as a mercury tank - a circular path forward through the delay line memory and back through electrical circuits along which a pattern of pulses representing information may be stored.

CHANNEL FREQUENCY -- The band of frequencies which must be handled by a carrier system to transmit a specific quantity of information.

CHANNEL INTERVAL -- Time allocated to a channel including on and off time.

CHANNEL PULSE SYNCHRONIZATION -- Synchronization of local channel rate oscillator by comparison and phase-lock with separate channel synchronizing pulses.

CHANNEL SAMPLING RATE -- Number of times per second individual channels are sampled. To avoid confusion, do not use channel-sampling rate to designate commutation rate or commutator-switching rate.

CHANNEL, SUBCARRIER -- The channel required to convey the telemetric information of a subcarrier band.

Constant Bandwidth -- Channels whose maximum permissible frequency deviations are constant, irrespective of the subcarrier center frequency.

CHANNEL, SUBCARRIER (continued)

Proportional Bandwidth -- Channels whose maximum permissible frequency deviations are proportional to subcarrier center frequency. In the IRIG Telemetry Standard document, these deviations are either ±7.5% or ±15%.

CHANNEL SYNCHRONIZING PULSE SEPARATOR -- A device for separating channel synchronizing pulses from commutated signals.

CHANNEL TRANSLATOR -- A device which converts individual separated channel pulses or signals to analog form for subsequent monitoring and/or recording. Alternate terms are "channel demodulator", "channel decoder" and "information gate".

CHARACTER (computer) -- 1. A decimal digit 0 to 9 or a letter A to Z, either in capital or lower case; a punctuation symbol or any other single symbol (such as appear on the keys of a typewriter) which a machine may take in, store or write. **2.** A representation of such a symbol in a pattern of 1's or 0's representing a series of positive and negative pulses. **3.** An ordered set of pulses considered as a unit. The term "character" is sometimes used interchangeably with the term "word," but more often a character is a subunit of a word, e.g., a single decimal digit in a multidigit number.

CHARACTER EMITTER (computer) -- An electromechanical device which emits a timed pulse or group of pulses in some code.

CHARACTERISTIC CURVE -- A curve obtained by plotting densities against the log of the exposure that produced these densities (log to the base 10); Hurter & Driffield curve.

CHART -- Any graphical display of data (e.g., oscillograph, line plot, bar graph). User may be required to specify:

- Nature of chart, size, axes orientation, paper speed.
- Intervals, sequence or segments.
- Axes labels and identification of axes by parameter (specify if special groups are required).
- Frequency response (peculiar to strip charts to determine the type of recording).
- Calibration and timing required.
- Number of traces, trace deflection and reference lines.

CHART (safety) -- Graphical presentation of missile performance used in connection with the design or interpretation of grids.

CHASE AIRCRAFT (safety) -- One used to gather information on the attitude and location of a missile when other means are not available.

CHECK (computer) -- A means of verifying information during or after an operation.

Built-in or automatic -- Any provision for verifying the accuracy of information transmitted, manipulated or stored by any unit or device in a computer.

Duplication -- A check requiring the identical results for two independent performances of the same operation, either concurrently on duplicate equipment or at a later date on the same equipment.

Forbidden combination -- A check, usually automatic, for the occurrence of a nonpermissible code expression.

Marginal -- A method of determining computer circuit weaknesses and incipient malfunctions by varying the power applied to various circuits, usually accomplished by lowering the dc supply of filament voltages or varying input signal amplitudes.

Mathematical or arithmetical -- A check making use of mathematical identities or other properties, frequently with some degree of discrepancy being A acceptable; e.g., checking multiplication by verifying that A times B is equal to B times A; checking a tabulated function by differencing, etc.

Modulo-N -- **1.** A form of check digits in which the number of 1's in each A operated upon is compared with a check number B, carried along with A, and equal to the remainder of A when divided by N. For example: in a Modulo-4 check, the check number will be 0, 1, 2, or 3 and the remainder of A when divided by 4 will equal the reported check number B, if an error or malfunction has not occurred. **2.** A method of verification by congruences; casting out 9's.

Odd-Even -- A check system in which a 1 or a 0 is carried along in a word depending on whether the total number of 1's or 0's in a word is odd or even.

Parity -- A summation check in which the binary digits in a character or word are added and the sum is checked against a single previously computed parity digit; a check which determines whether the number of 1's is odd or even.

CHECK (computer) -- (continued)

Programmed -- To determine the correct program and machine functioning by running a sample problem with similar programming and known answers; includes mathematical or logical checks such as comparing A times B with B times A, when reliance is placed on a high probability of correctness rather than built-in checking systems or error-detection circuits.

Redundant -- A check which uses extra digits, short of complete duplication, to help detect malfunctions and mistakes.

Summation -- A redundant check whereby groups of digits are added (usually without regard to overflow) and the result is checked against a previously computed sum to verify accuracy.

Transfer -- Verification of transmitted information by temporarily storing, retransmitting and comparing it.

Twin -- A continuous check achieved by duplication of hardware and automatic comparison of data.

CHECK BIT -- A redundant bit or digit carried with a group of bits or digits in such a way that an inaccurate retrieval of that group of bits or digits is detected if the number of errors is odd. (See **parity check**.)

CHECK DIGIT --(Same as **check bit**.)

CHECKPOINT -- A point in a routine at which sufficient information can be stored to permit restarting the computation from that point.

CHECK SUM -- A summation of digits or bits used primarily for checking purposes and summed according to an arbitrary set of rules.

CHEMICAL HYGROMETER -- (See **absorption hygrometer**.)

CHIRP (radar) -- 1. An all-encompassing term for the various pulse-expansion pulse-compression techniques applied to pulse radar. **2.** A technique to expand narrow pulses to wide pulses for transmission and to compress wide received pulses to the original narrow pulse width and waveshape. This will improve signal-to-noise ratio without degradation to range resolution and range discrimination.

CHRONOGRAPH (geodetic) -- An instrument for producing a graphical record of time. In use, a chronograph produces a double record. The first record is made by the associated clock and forms a continuous time scale with marks indicating periodic beats of the timekeeper. The second record is, made by some external entity, human or mechanical, and records the occurrence of an event or a series of events. The times of such occurrences are read on the time scale made by the clock. In observations for time and longitude, the times of star observations are recorded on the chronograph manually by pressing a key at the instant a star is bisected by a line of the reticle of the telescope, or automatically by keeping a star bisected by a movable wire as it travels across the field of view. In longitude work, the chronograph also records the time signals received from the station of known latitude which is used as a base. (See **micrometer, transit**.)

CHRONOMETRIC DATA -- Data in which the desired quantity is the time of occurrence of an event or the time interval between the two events.

CINCHING -- Tightening a roll of film by holding the spool and pulling the free end; results in parallel scratches and abrasion marks.

CINETHEODOLITE -- A ground-based tracking instrument combining a theodolite and a pulsed or free running camera in which the relationship between the instrument line of sight and orientation of the theodolite can be measured and recorded simultaneously with an image of the target on the same frame of film. Types of cameras and manufacturers are Servo Synch (Contraves EOTS), Pulsed Cinetheodolite (Askania) and Free-Running Cinetheodolite (Akeley or Mitchell).

CIRCLE OF CONFUSION -- The diameter of the lens image of a point source resulting from the failure of the lens or optical system to image a point object as a point. The circle diameter depends upon the contrast, color, sensitivity, and other factors of the evaluation or measurement system. The maximum permissible size of a disc in the lens image at a point source is 0.002 inch for metric photography and 0.01 inch for amateur photography. This disc should not be greater than 0.01 inch when enlarged. This size has been arbitrarily adopted as the maximum diameter to produce a sharp picture.

CIRCUIT CLOSURE (leveling) -- The amount by which the algebraic sum of the measured differences of elevation around a circuit fails to equal the theoretical closure, zero.

CIRCULAR ERROR PROBABLE (CEP) -- An indicator of the accuracy of a missile/projectile; used as a factor in determining probable damage to a target or for determining the radius of a circle within which half the missiles or projectiles are expected to fall.

CIRCULARLY POLARIZED WAVE -- An electromagnetic wave for which the electric and/or magnetic field vector at a point describes a circle.

CIRCULATOR, FERRITE -- A nonreciprocal microwave network which transmits power from one terminal to another in sequence. It can replace a conventional duplexer, provide isolation of transmitter from receiver, eliminate the requirement for an Antitransmit Switch (ATR), and isolate the transmitter from antenna reflections.

CLAMPING -- The connection of some point of a circuit to a desired reference potential for certain periods of time. Sometimes called "dc restoration."

CLEAR --

Computer -- To erase the contents of a storage location or register by replacing the contents with a predetermined character, such as 0, 1 or 9.

Meteorological -- As used in United States weather observing practice, the state of the sky when it is cloudless or when the sky cover is less than 0.1 of the observable sky (to the nearest tenth).

CLEAR-AIR TURBULENCE -- In aviation terminology, turbulence encountered by aircraft when flying through airspace devoid of clouds. Thermals and wind shears are the main causes of clear-air turbulence. Studies have shown a correlation between the position of the jet stream and reported occurrences of high-altitude, clear-air turbulence.

CLEARANCE CLOSING (ballistic camera) -- Position of capping shutter blades when the lens paraxial ray is cutoff..

CLEARANCE OPENING (ballistic camera) -- Diameter of shutter opening when marginal lens rays clear the blades of a capping shutter.

CLEAR TO LAUNCH (safety) -- Verbal approval which must be given by the Range Safety Officer before any missile can be launched; normally given within 3 minutes of launch time.

CLOCK PULSE -- One of a train of uniformly time-spaced pulses used to establish a time reference rate or to provide synchronization within a computer or other digital processing system. In PCM systems, usually a timing pulse which occurs at the bit repetition rate.

CLOSED SHOP -- A computing installation at which all computer programming, coding and operating functions are performed by members of a regular computing group.

CLOSED LOOP TELEMETRY -- A system used to checkout test vehicle and/or telemetry performance without radiation of RF energy.

CLOSING DWELL (ballistic camera) -- Time interval between energizing the closing solenoid and the beginning of actual closing (clearance closing position) in a capping shutter.

CLOSING TIME (ballistic camera) -- Time interval required by the capping shutter blades to reach the clearance closing position from a fully open position. Closing time equals closing dwell plus closing transport.

CLOSING TRANSPORT TIME (ballistic camera) -- Time interval between the clearance opening position and the clearance closing position in the closing cycle of a capping shutter.

CLOUD COVER -- That portion, usually described in tenths or eighths, of the celestial dome which is obscured by clouds; described by the terms clear (0/10), scattered (1/10 to 5/10), broken (6/10 to 9/10), and overcast (10/10).

CLUTTER -- A term used to describe signals reflected from rain, chaff, the Earth's surface, the surface of the sea, etc.

COARSE CHANNEL -- The data channel which supplies coarse data to prevent ambiguity in the precise data of a fine channel.

COAST -- A memory feature on a radar which, when activated, causes the range and/or angle systems to continue to move in the same direction and at the same speed as the target; used to prevent lockup to a stronger target if approached by the target being tracked.

CODAN -- A device which silences a receiver except when a carrier signal is being received. (See **squelch**.)

CODE -- 1. The assignment of a definition to a character or group of characters, e.g., an alphabet. **2.** A label to identify a routine, location, operator, operand, name, etc. **3.** To translate and write information in an abbreviated or shorthand form, e.g., to write machine instructions, symbolic notation, etc., from a statement of the problem.

CODE -- (continued)

Error-correcting -- A code containing redundant information which can restore certain classes of detected errors to their original form.

Error-detecting -- A code containing redundant information which can be used to indicate the presence of certain classes of unintentional alterations of data.

Excess-three -- A number code in which the decimal digit is represented by the four-bit binary equivalent of n plus 3.

Gray -- A binary number code in which only one bit changes at a time as the number progresses. Sometimes called "reflected binary code."

Interrogation or reply (radar) -- A series of voltage or power pulses of varying width or spacing such that its interpretation represents specific information.

Octal -- A method of representing a quantity by using a numbering system based on the powers of 8. For example:
Octal (214) means
$[(2 \times 8^2) + (1 \times 8^1) + (4 \times 8^0)]$ decimal which reduces to:
$[(2 \times 64) + (1 \times 8) + (4 \times 1)] =$
$[128 + 8 + 4] = 140$

Octal binary -- A method of indicating a binary number by means of the Arabic numerals 0 through 7. Each Arabic numeral represents three bits, or digits, of the binary number. For example:
0=(000), 1=(001), 2=(010), 3=(0ll),
4=(100), 5=(101), 6=(110), 7=(lll).
Octal (214) can be written in octal binary code as follows:
Octal (214) means [(010) + (001) + (100)] binary equivalents of decimals which equal:
$[(l \times 2^7) + (1 \times 2^3) + (1 \times 2^2)]$ decimal which reduces to:
$[(128) + (8) + (4)] = 140$

CODED DECIMAL -- A form of notation by which each decimal digit is separately converted into a pattern of binary 1's and 0's. For example: in the 8-4-2-1 coded decimal notation, the number 12 is represented as 0001 0010 (for 1,2), whereas, in pure binary notation it is represented as 1100. Other coded decimal notations are known as 5-4-2-1, excess three, 2-4-2-1, etc.

CODED DECIMAL DIGIT -- A decimal digit which is expressed by a pattern of four or more 1's or 0's.

CODE DIGIT WEIGHING -- The numerical value assigned to each bit position in a code word.

CODER -- 1. One who translates a sequence of instructions into precise codes. **2.** A device for inserting coded information into a system or through a system, e.g., shaft-position digitizer, analog-to-digital converter, radar transmitter pulse encoder. (See **digitizer, encoder**.)

CODE WORD -- A group of elements between two successive reference markers that are arranged according to the rules of its code and that collectively identify a particular instant in time of the preceding reference marker.

CODING -- Listing in computer code or in pseudocode the successive computer operations required to solve a given problem, employing flow charts and mathematical equations as aids.

COHERENT CARRIER -- A carrier derived from a continuous wave (cw) signal whose frequency and phase have a fixed relationship to the frequency and phase of the reference signal.

COHERENT OSCILLATOR -- One which provides a reference by which the RF phase difference of successive received pulses may be recognized (acronym: "COHO").

COHERENT REFERENCE -- The reference signal, usually of stable frequency, to which other signals are phase-locked to establish coherency throughout a system.

COHERENT TRANSPONDER -- One where the output signal is coherent with the input signal. Fixed relation between frequency and phase of input and output signal are maintained.

COHERENT VIDEO (radar) -- The video resulting from the echoes and the continuous wave oscillator as used in Moving Target Indicator (MTI) circuits to provide a cancellation signal. After delay, the signal is detected, amplified and subtracted from the next pulse train.

COLLIMATION (boresight) -- The alignment or state of alignment of optical systems.

Line of -- The line through the second nodal point of the object glass of a telescope and the center of the reticle; also called the line of sight, sight line, pointing line, and aiming line. The center of the reticle of the telescope of a transit may be defined by the intersection of cross hairs or by the middle point of a fixed vertical wire or of-- a micrometer wire in its mean position. In a leveling instrument, the center of the reticle may he the middle point of a fixed horizontal wire.

Radar -- The precise alignment of the mechanical system of a radar antenna by comparison with an optical device aligned on known points in azimuth and elevation.

COLLIMATION ADJUSTMENT -- The process of bringing the line of collimation of a telescope into close agreement with the collimation axis.

COLLIMATION AXIS -- The line through the second nodal point of the objective (object glass) perpendicular to the axis of rotation of the telescope. In a surveyor's transit, the collimation axis is perpendicular to the vertical axis of the instrument. (See **axis, optical**.)

COLLIMATION PLANE -- The plane of a transit described by the collimation axis of a telescope when rotated around its horizontal axis.

COLLIMATION TARGET -- A synthetic distant target. Collimation Effective Focal Length (EFL) and quality shall be such that an error in focal length introduced by the collimator is less than 0.02 percent of the focal length of the lens being measured. The beam shall at all times completely fill the effective aperture of the optical system being tested.

COLLIMATOR -- A convergent achromatic lens with a mark placed in the plane of its principal focus so that rays from the mark through the lens emerge along parallel lines. The mark in a collimator may be viewed from very short distances as if it were at an infinite distance, and may therefore be used in place of a distant mark when making any adjustment of the line of collimation of an instrument. In adjusting a surveying instrument, the telescope of another surveying instrument may be used as a collimator (the reticle furnishing the mark) or the telescope of a discarded instrument may be placed on a special mounting to form a permanent installation. In some astronomical instruments, a vessel of mercury placed directly under the instrument is used as a collimator. A prismatic eyepiece used with such an instrument is sometimes called a collimating eyepiece.

COLLIMATOR, VERTICAL -- A telescope mounted so that its collimation axis can be made to coincide with a vertical line; serves as an optical plumb line. May be designed for use in placing a mark on the ground directly under an instrument on a high tower or in centering an instrument on a high tower directly over a mark on the ground.

COLOR-SENSITIVITY -- The sensitivity of a photographic emulsion to light of various wavelengths.

COLOR TEMPERATURE -- The temperature to which a blackbody radiator must be raised in order for the light it emits to match a given light source or color. Usually expressed in degrees Kelvin (^{o}K).

COLUMN SPLIT -- A device for partitioning a card column, while reading or punching, that places the punch positions corresponding to two portions of the column on separate wires.

COMMAND, COMPUTER -- (See **instruction**.)

COMMAND CONTROL -- A system whereby functions are performed as the result of a transmitted signal.

COMMAND CONTROL LINK (radar) -- The transmitting of various radar signals to a beacon for control of aircraft or missiles.

COMMAND DESTRUCT (safety) -- 1. Externally initiated destruction system. **2.** Deliberate initiation of flight termination by the Range Safety Officer when the missile fails to perform as programmed.

COMMIT ZONE (safety) -- That area in which the missile will be committed to continue its flight over an overflight corridor to the impact zone.

COMMUTATION -- Sequential sampling, on a repetitive timesharing basis, of multiple data sources for transmitting and/or recording on a single channel.

COMMUTATION DUTY CYCLE -- Channel dwell period; expressed as percent of channel interval.

COMMUTATION FRAME PERIOD (telemetry) -- Time required for sequential sampling of all input signals. This period would correspond to one revolution of a simple multicontact rotary switch. (See **prime frame** and **subframe**.)

COMMUTATION RATE -- Number of commutator inputs sampled per second.

COMMUTATOR -- A device used to accomplish time division multiplexing by repetitive sequential switching.

COMMUTATOR CHANNEL DWELL PERIOD -- Time during which the channel is on.

COMMUTATOR SEGMENT -- One of the stationary contacts of a mechanical commutator.

COMPARATOR --

Computer -- A device for comparing two different transcriptions of the same information to verify agreement or determine disagreement.

Geodetic -- An instrument or apparatus for measuring a dimension in terms of a standard. In plane and geodetic surveying, a comparator may be an instrument for comparing standards of length, for subdividing such standards, or for determining a standard length of a measuring device (bar, tape, etc.). A field comparator or comparator base is a short line whose length is measured with accuracy and precision; used to check the lengths of tapes employed in actual field operations. There are special types of comparators used for astronomic and photogrammetric work and for various kinds of laboratory work.

Optical -- A precision measuring device used in the data reduction process for reading film on glass plate records.

COMPARATOR CIRCUIT -- 1. A circuit which compares two signals and supplies an indication of agreement or disagreement. **2.** A mechanism by which two items of information may be compared in certain respects and a signal given depending on whether they are equal or unequal.

COMPASS, SOLAR -- A surveying instrument which effects the instantaneous mechanical solution of the astronomical triangle (sun-zenith-pole) and permits the establishment and surveying of the astronomic meridian or astronomic parallel directly by observation. Originally invented and used for the establishment of astronomic meridians and parallels in the survey of the public lands of the United States, the solar compass has been replaced by the solar attachment in combination with a transit or by the solar transit.

COMPASS, SURVEYOR'S -- An instrument for determining the magnetic azimuth of a line of sight by means of a sighting device, a graduated horizontal circle, and a pivoted magnetic needle.

COMPENSATION -- Provision of a supplemental device, special materials or information to counteract known sources of error.

COMPENSATION SIGNAL -- A signal recorded on tape, along with the data, which is used during the playback to electrically correct for the effects of tape speed errors.

COMPILE (computer) -- To produce one sequentially ordered machine language routine from a number of open, closed or control routines and code or symbolic statements.

COMPILER (computer) -- A program-making routine which produces a specific program for a particular problem by: **a.** determining the intended meaning of an element of information expressed in pseudocode; **b.** selecting or generating (calculating from parameters and skeleton instructions) the required subroutine; **c.** transforming the subroutine into specific memory registers, etc., and entering it as an element of the problem program; **d.** maintaining a record of the subroutines used and their position in the problem program; and **e.** continuing to the next element of information in pseudocode.

COMPRESSION -- The ratio of the small-signal power gain (g_c) of a device to the power gain (g_1) at some higher level; expressed in decibels.

COMPUTER -- 1. A machine which calculates or computes, i.e., performs sequences of operations (mainly arithmetical and logical). **2.** Generally, any device which accepts information, applies definite processes and supplies results.

Analog -- A calculating machine which solves problems in a continuous manner by representing physical variables such as flow, temperature or pressure by electrical quantities and uses electrical equivalent circuits to represent the physical phenomena.

Digital -- A computer which processes information represented by combinations of discreet or discontinuous data. Distinguished from analog computer for continuous data.

Satellite -- A processor under the control or access of a large central computer system which is capable of doing independent computations or calculations under direction of a central facility.

Solid-state -- A computer using semiconductor devices.

Stored-program -- A computer which can alter its own instructions in storage as though they were data and subsequently execute them.

COMPUTER RESOURCES --

Centralized -- Computing or data processing facilities in a single, central location which process data obtained from various managerial levels or geographical locations.

Decentralized -- Computing or data processing facilities located at various managerial or geographical points throughout an organization or installation.

CONCENTRICITY -- Coincidence of the geometrical and optical axes of a lens. Concentricity errors may occur between successive assemblies not properly aligned or because of loose elements within the retaining fixtures of the assemblies.

CONDENSATION TRAIL -- A cloud-like streamer which frequently forms behind aircraft or missiles flying in clear, cold, humid air; contrail, vapor trail.

CONDENSER -- A lens (or pair of lenses) which gathers light from a source to more adequately illuminate an object. Commonly used in slide projectors, photographic enlargers, etc.

CONDITIONAL TRANSFER INSTRUCTION (computer) -- A transfer which occurs only when a certain condition exists at the time the transfer instruction is executed; conditional jump instruction.

CONDUCTION ERROR (transducer) -- The error in a temperature transducer due to heat conduction between the sensing element and the transducer mount.

CONSTANT-HEIGHT SURFACE -- In meteorology, a surface of constant geometric or geopotential altitude measured with respect to mean sea level; constant-level surface, isohypsic surface.

CONSTANT-PRESSURE SURFACE -- In meteorology, a surface along which the atmospheric pressure everywhere is equal at a given instant; isobaric surface.

CONTENTS OF (computer) -- A phrase frequently represented by parentheses enclosing an address and used to denote the contents of the corresponding storage location; e.g., the contents of storage location M is written (M).

CONTINUOUS RATING -- The rating applicable to operation for a specified uninterrupted length of time.

CONTINUOUS WAVES -- Electromagnetic waves generated as a continuous train of identical oscillations; can be interrupted according to a code or modulated in amplitude, frequency, or phase in order to convey information.

CONTOUR -- An imaginary line on the ground, all points of which are at the same elevation above a specified datum surface. A contour is illustrated by the shoreline of an imaginary body of water whose surface is at the elevation represented by the contour. A contour forming a closed loop around lower ground is called a depression contour. The datum surface most generally used for contours in this country is mean sea level.

CONTOUR INTERVAL -- In mapping, the difference in elevation of two adjacent contours.

CONTRAST -- In general, the degree of differentiation between varying tones. When the degree is slight, the image is said to be flat. Contrast may be expressed numerically as the log of the ratio of the opacities of the lightest and densest parts, or as the difference in their densities.

CONTRAVES -- A cinetheodolite manufactured by the company of the same name.

CONTROL, BASIC (geodetic) -- In general, coordinated and correlated position data forming a framework to which detail surveys are adjusted. Basic control may be either horizontal or vertical; usually executed with greater precision and accuracy than is required for dependent surveys. The basic control for the topographic map of the United States consists of first- and second-order triangulation and traverse and first- and second-order leveling.

CONTROL CARD -- A card which contains input data or parameters for a specific application of a general routine,

CONTROL, GEODETIC -- A system of control stations established by geodetic methods. Geodetic control data are first determined in the form of geodetic coordinates and azimuths, which are now sometimes transposed into plane-coordinate data on a state system, before being used as bases for local surveys.

CONVERGENCE OF MERIDIANS -- The angular drawing together of the geographic meridians in passing from the Equator to the poles. At the Equator, all meridians are mutually parallel; passing from the Equator, they converge until they meet at the poles and intersect in angles that are equal to their differences of longitude. The term is used to designate the relative difference or direction of meridians at specific points on the meridians. Thus, for a geodetic

line, the azimuth at one end differs from the azimuth at the other end by 180°, plus or minus the amount of the convergence of the meridians at the end points.

CONVERSION -- The process of changing information from one representation or form to another, i.e., from one number base to another or from one data medium to another.

CONVERTIBLE LENS -- A lens containing two or more elements that can be used individually or in combination.

COOPERATIVE TRACKING SYSTEM -- Usually a system which requires addition of a transmitter, flare, flashing light, or reflector onboard the vehicle. For example: one-way Doppler.

COORDINATES -- Linear or angular quantities, or both, which designate the position of a point in relation to a given reference frame. In surveying there are two general divisions of coordinates: polar and rectangular. These may each be subdivided into three classes: plane coordinates, spherical coordinates and space coordinates.

Astronomic -- Quantities which define the position of a point on the geoid with reference to the planes of the celestial Equator and of a selected celestial meridian. (See **latitude, astronomic; longitude, astronomic**.)

Cartesian -- (See **coordinates, rectangular space**.)

Geocentric (terrestrial) -- Quantities defining the position of a point on the earth by means of the angles made by a line from the center of the earth to the point with the planes of the celestial Equator and of a selected initial geodetic meridian. The term geocentric longitude is never used, since the quantity which it would designate is the same as geodetic latitude. (See **latitude, geocentric**.)

Geodetic -- Quantities which define the horizontal position of a point on the spheroid of reference with respect to the planes of the geodetic Equator and of selected geodetic meridian. (See **latitude, geodetic; longitude, geodetic; position, geodetic**.)

Geographic -- An inclusive term used to designate both geodetic and astronomic coordinates.

COORDINATES -- (continued)

Grid -- Two distances which fix the position of a point on a grid. One is the perpendicular distance to the point from the axis of Y and is termed the "abscissa" or "x coordinate". The other is the perpendicular distance from the axis of X and is termed the "ordinate" or “y” coordinate". In surveying operations, the nominal origin at the intersection of the axes is usually given large numerical coordinates so the inconvenience of using negative coordinates will be avoided. Geodetic coordinates (latitudes and longitudes) may be transformed into grid coordinates, and all survey computations relating to them made by the methods and formulas of plan surveying. (See **state coordinate systems**.)

Origin of -- The initial point in a system of coordinates used in computing its elements or in prescribing its use. The term “origin of coordinates" has several definitions, each so well established in use that a single definition cannot be prescribed to the exclusion of the others. Therefore, the following are given in the order of preferred use. To avoid misunderstanding, the use should be defined by stating the position of the origin in the system and giving the numerical coordinates assigned to it. **a.** The point of intersection of the coordinate axes from which the coordinates are determined. In mathematical treatises this origin is usually given the ordinates (0, 0). In surveying, however, it is standard practice to give this origin coordinates having large positive numerical values, thereby avoiding the use of negative coordinates. (See **state coordinate systems**.) **b.** The point to which the coordinate values (0, 0) are assigned, regardless of its position with reference to the axes. **c.** The point from which the computation of the elements of the coordinate system (projection) proceeds.

Plane-rectangular -- The perpendicular distances (coordinates) of a point from a pair of axes which intersect at right angles, reckoned in the plane defined by those axes. Plane-rectangular coordinates are usually calculated from data which are in the form of polar coordinates, i.e., distance and direction (bearing or azimuth) from a previously determined point (for example: the computation of latitudes and departures in land surveying). The methods used are based on plane trigonometry and geometry. The position of a point on the earth may be defined by plane-rectangular coordinates on a tangent plane (local system of plane coordinates) or on a so-called conic or cylindrical map projection as used in the state plane-coordinate system.

COORDINATES -- Polar -- (continued)

Polar (General) -- The distance and direction from a central point of reference to a Point whose position is being defined, The point of reference is termed the pole or origin. The line (distance connecting the origin with the point whose position is being defined) is the radius vector. The angle between the fixed line to which the direction is referred and the radius vector is the vectorial angle. In surveying operations, observations are usually put in the form of polar coordinates as the first step in the computation of plane or spherical coordinates. For example: computations of geodetic positions (latitudes and longitudes) are based on azimuths and distances from known positions.

Rectangular space -- The perpendicular distances of a point from planes defined by each pair of a set of three axes which are mutually perpendicular to each other at a common point or origin. In photogrammetry, space coordinates are also termed survey coordinates and are the x and y coordinates which define the horizontal position of a point on a ground system, and the z coordinate which is the elevation of the point with reference to the ground system.

Spherical -- Two quantities (angular, linear or both) on a sphere defining the position of a point with reference to two great circles which form a pair of axes, or with reference to an origin and a great circle through the point. The term "spherical coordinates" includes coordinates on any surface approximating a sphere. (See **coordinates, geographic; geodetic; astronomic**.)

Vertical -- The vertical distance (elevation) of a point above or below a surface of reference (datum). The vertical coordinate of a point may be plus or minus, according to whether the point is above or below the datum. The datum may be assigned a large positive elevation so that all elevations referred to it will be positive. Instead of elevation, the term "height" is sometimes used.

COPY (computer) -- To reproduce information and store it at a new location without destroying the original information.

CORE STORAGE (computer) -- A form of high-speed storage using magnetic cores.

CORRECTION, ORTHOMETRIC -- Applied to a preliminary elevation to correct for the error introduced when level surfaces at different elevations are not exactly parallel.

CORRELATION DETECTION -- A method by which a signal is compared, point-to-point with an internally-generated reference. The output of such a detector is

a measure of the degree of similarity of the input and reference signals. The reference signal is constructed in such a way that it is at all times a prediction or best guess of -what the input signal should be at that time.

CORRELATION TRACKING AND RANGING (COTAR) -- A nonambiguous, short-baseline, single station, continuous wave phase-comparison system from which space position can be computed by measuring two direction cosines and a slant range.

CORRELATION TRACKING AND TRIANGULATION (COTAT) -- A trajectory measuring system composed of several antenna baselines, separated by large distances, used to measure direction cosines to an object. From these measurements its space position is computed by triangulation.

CORRELATION TRACKING SYSTEM -- A system using techniques in which signals obtained from the same source are correlated to derive the phase difference between the signals. This phase difference contains the system data.

COSINE AMBIGUITY -- Occurs in the direction cosine measured by Angle Measuring Equipment (AME).

COUNTER -- 1. A register or technique which permits numbers to be altered by an arbitrary amount. **2.** (computer) A device, register or location for storing integers, permitting these integers to be increased or decreased by unity or by an arbitrary integer, and capable of being reset to zero or to an arbitrary integer.

Control -- A device for recording the storage location of the instruction word which follows the instruction word I in current use. The control counter may select storage locations in sequence, thus obtaining the next instruction word from the storage location following it, unless a transfer or special instruction is encountered.

Ring -- A loop of interconnected bistable elements arranged so only one is in a specified state at any given time, and so that, as input signals are counted, the position of the one specified state moves in an ordered sequence around the loop.

CREST FACTOR -- The ratio of the peak amplitude to the root-mean-square (rms) amplitude.

CRITICAL ANGLE -- The 90° angle a refracted ray makes with the normal when light passes from a dense medium to a rare medium under an increasing angle with the perpendicular. Past this angle, internal or total reflection sets in.

CRITICAL AZIMUTH (safety) -- A flight azimuth for which the real-time presentation of missile position cannot meet the criteria of an adequate source presentation.

CRITICAL DAMPING -- The value of damping which provides the most rapid transient response without overshoot,

CROSS-AXIS ACCELERATION -- (See **transverse acceleration**.)

CROSSED BASELINE SYSTEM -- Two intersecting baselines of angle measuring equipment (usually perpendicular bisectors of each other) measuring two direction cosines of known relationship to each target being tracked.

CROSSED NODES -- Occurs in a lens when the node of admission is nearer to the image than the node of emission. The nodal space is then negative and is included both in the object-lens distance and in the lens-image distance.

CROSS HAIR -- A cross-like position mark located in an optical image plane; used, for example, as the guidelines in cinetheodolite tracking telescopes.

CROSS SENSITIVITY -- (See sensitivity, transverse.)

CROSS TALK -- Interference in a given transmitting or recording channel which has its origin in another channel; often used as equivalent to transverse sensitivity (transducer). (See **sensitivity, transverse**.)

CROSSWIND -- 1. A wind component which is directed perpendicularly to the course or heading of an exposed, moving object; more popularly, a wind which predominantly acts in this manner; in the broadest sense, any wind except a direct headwind or tailwind. **2.** That wind vector component which is perpendicular to the course of an exposed, moving object.

Path-averaged -- The average magnitude of the wind vector component perpendicular to a straight horizontal path of specified length. An integrated path-averaged crosswind can be measured with any of several types of optical crosswind systems and sensors, i.e., laser crosswind system, saturation resistant crosswind system, etc.

CRYOTRON -- A device using properties assumed by metals at near absolute zero temperature so that large current changes can be obtained by relatively small magnetic field changes.

CRYSTAL DETECTOR -- A crystal diode (usually germanium) in a receiver, which is used to mix the incoming signal with a local oscillator signal to produce

an intermediate frequency or to produce a video signal directly when no local oscillator is used.

CRYSTAL SHUTTER -- A mechanical waveguide or coaxial shorting switch which, when closed, prevents RF energy from reaching the crystal detector.

CRYSTAL TRANSDUCER -- (See **piezoelectric transducer**.)

CRYSTAL VIDEO RECEIVER -- An RF receiver which converts, by crystal detection, the fundamental received frequency to an audio or video signal corresponding to the envelope of the RF energy and amplifies it subsequent to detection.

CULMINATION -- The position of a heavenly body when at highest apparent altitude. Also, the position of lowest apparent altitude, for a heavenly body which is continually above the horizon. Culmination occurs when the body transits the local meridian (upper culmination at the upper branch of the meridian, lower culmination at the lower branch). As an observer approaches a pole of the earth, culmination of the fixed stars becomes less noticeable, disappearing when the pole is reached. Under some conditions for bodies within the solar system, culmination may be largely obscured by changes in declination. At one time, moon culminations were extensively used in determining astronomic longitude.

CURVED-PATH ERROR -- The difference between the length of a ray refracted by the atmosphere and the straight-line distance between the ends of the ray.

CURVE OF REGRESSION -- A realistic curve of arbitrarily selected degrees having a least-squares fit relation to the data points. The regression curve should be the best least-squares estimate of the true curve of the phenomenon observed that can be made in view of the data and prior knowledge of the physics of the phenomenon. A regression curve is displaced from the true curve by the amount of any bias error and of most systematic errors.

CURVILINEAR DISTORTION -- A defect of a single lens whereby straight lines falling near the margins of the film or plate are bent inward (pincushion distortion) or outward (barrel-shaped distortion) .

CUT-OFF (safety) -- Terminating the propulsion of a rocket.

CYBERNETICS -- The science and philosophy of exploring the analogies between organic and machine processes.

CYCLE -- A set of operations repeated as a unit.

Computer -- **1.** A set of operations repeated a specified number of times; includes, when required, supplying necessary memory location address changes by arithmetic processes or by means of a hardware device such as a cycle-counter. **2.** The smallest period of time or complete process of action that is repeated in order. In some computers, minor cycles and major cycles are distinguished.

Computer Arithmetic -- A shift of the digits of a number so that digits removed from one end of the word are inserted sequentially in a circular fashion at the other end of the word. Also called a "ring shift".

Telemetry -- The sequence of samples from all the prime channels.

CYCLONE -- 1. An atmospheric cyclonic circulation or a closed circulation; generally, the generic form for all circular or highly curved wind systems. (While modern meteorology restricts the use of the term “cyclone" to the so-called cyclonic-scale circulations, it is still popularly applied to more-or-less violent, small-scale circulations like tornadoes, waterspouts, dust devils, etc. which may exhibit anticyclonic rotation.) **2.** Refers loosely to any strong wind. Because cyclonic circulation and relative low atmospheric pressure usually coexist, the terms "cyclone" and "low" are used interchangeably in common practice.

CYCLONIC -- A rotation about the local vertical which is the same as that of the Earth’s rotation as viewed from above: counterclockwise in the Northern Hemisphere, clockwise in the Southern Hemisphere and undefined at the Equator.

DAMPING -- A characteristic built into electrical circuits and mechanical systems to prevent or reduce unwanted oscillatory conditions.

Meteorological -- The suppression of the growth of oscillations or disturbances. Damping usually refers to the decrease, with time, in amplitude or energy of atmospheric disturbances due either to a reversible energy conversion process or to the action of viscous or frictional effects.

Transducer -- The energy dissipating characteristics which, together with natural frequency, determine the upper limit of frequency response and the response-time characteristics of a transducer.

DAMPING FACTOR -- The ratio of any one amplitude to the next succeeding amplitude in the same sense or direction when energy is not supplied on each cycle. In second-order systems with single degree of freedom, the decrement is constant. The amplitude decays as $e^{-\delta t}$ where t = time and δ = logarithmic decrement.

DAMPING RATIO -- The ratio of actual damping to critical damping. May be expressed as the ratio of output under static conditions to twice the output at the lowest frequency where a 90° phase shift is observed.

DANGER AREA (safety) -- A land or water area, including the impact area, upon which ordnance may safely fall. Such ordinances may include expended shells, links or target debris. The danger area must be large enough to provide for any possible malfunction of the ordnance. It must also provide safe separation on missions involving high explosives which might endanger populated areas by concussion and/or other physical effects upon personnel or property.

DANGER PERIOD (safety) -- The time during which a hazardous condition exists and the risk level is sufficiently high to jeopardize the safety of personnel.

DARK FIELD -- A special lighting technique whereby an extremely fine object is visible by illuminating it from the side. The illumination is not detected except by reflection from the object itself.

DATA -- A plural noun used to designate alphabetic or numeric material which serves as a basis of discussion; material may or may not be technical in nature. Information, particularly that used as a basis for mechanical or electronic computation. A collection of facts, numbers, letters, symbols, etc., from which a conclusion can be drawn.

DATA -- (continued)

Performance -- Any range data describing the behavior of a vehicle during an operation; includes vehicle position and attitude (trajectory data), external appearance (engineering sequential photography), and internal operation (telemetry or other data). Performance data can be externally collected by range instruments such as radars and cameras, or internally transmitted from the test vehicle to the ground via methods like radio telemetry, etc.

Range -- Any scientific data describing an aerospace vehicle's performance or environment during a range-supported operation.

Raw -- Unprocessed test data. Different groups, depending on their functions, refer to various forms of data as *raw*. A photographic processing group may regard the latent image as raw data, a reading group may regard the photographic data as raw data, a computing group may regard certain digital data as raw data, and so on.

DATA ASSIMILATOR -- A device which synchronizes the flow of data between digital systems whose flow rates and internal timing are dependent, different and/or asynchronous.

DATA AUTOMATION -- The use of electronic, electromechanical and mechanical technology and associated techniques to automatically record, communicate and process data and to present the resulting information.

DATA BANDWIDTH -- The difference between the highest and lowest frequency of the data to be telemetered.

DATA BUFFER -- A device which synchronizes the flow of data between digital systems whose flow rates and internal timing are independent, different and/or asynchronous.

DATA COLLECTION -- The act of bringing data from one or more sources to a central location

DATA CONVERSION -- The process of changing data from one form of representation to another.

DATA DISPERSION -- A measure of the scatter of data around a mean value or around a curve of regression. Usually expressed as a standard deviation estimate or as a standard error of estimate. The scatter is not around the true value unless systematic errors are zero.

DATA ELEMENT -- The smallest unit of information to which the user makes reference, such as name, service number, track number, weapon number, etc.; synonymous with data fields on punched cards or on tape.

DATA INTERFACE -- A common aspect of two or more data systems involving the capability of intersystem communication.

DATA ITEM -- 1. A unit of information. **2.** The value reported under a data element.

DATA LINK -- Electronic equipment that coordinates data collection, reduction and analysis.

DATA PLAYBACK TRANSLATOR -- A device that accepts recorded trajectory data in one form and converts it to another form.

DATA POINT -- 1. A unit of fundamental information obtained through the processing of raw data. **2.** Any reference point of known or assumed coordinates from which calculations or measurements may be taken.

DATA PROCESSING -- 1. The application of mechanical, computational or other procedures which change data from one form into another. **2.** A generic term referring to all business machine applications.

DATA PROCESSOR (computer) -- A device capable of accepting, processing and reporting information.

DATA REDUCTION -- The process of transforming raw test data or experimentally obtained data, usually obtained by instrumentation, into useful, ordered or simplified intelligence.

DATA SMOOTHING -- The process of fitting a smooth curve to dispersed data points.

DATA SYSTEM -- The means of converting data into action and/or decision information, including the forms, procedures and processes which together provide an organized and interrelated means of recording, communicating, processing and presenting information related to a definable function or activity.

DATA TRAIN (cinetheodolite) -- An internal optical system used to transmit data from the axis scales to the film.

DATA TRANSMISSION SYSTEM -- An electronic system which conveys real-time target-position data from a tracking station to a remote location for plotting.

DATUM -- Any numerical or geometrical quantity or set of such quantities which serves as a reference or base for other quantities. For a group of statistical references, the plural form is "data" (for example: geographic data for a list of latitudes and longitudes). When the concept is geometrical and particular, rather than statistical and inclusive, the plural form is datums (for example: two geodetic datums have been used in this country in recent years).

Geodetic -- A datum consisting of five quantities: the latitude and longitude of an initial point, the azimuth of a line from this point, and the two constants necessary to define the terrestrial spheroid; forms the basis for the computation of horizontal control surveys in which the curvature of the earth is considered.

Leveling -- A level surface to which heights are referred. The elevation of the datum is usually, but not always, zero. The generally adopted datum for leveling operations in the United States is mean sea level. For local surveys, where a sea-level connection is not available, an arbitrary datum may be adopted and defined in terms of an assumed elevation for some physical mark (bench mark). Since a datum for spirit leveling is not a plane, the term *datum plane* is incorrectly used in such a connection.

DAY --

Apparent solar -- The interval of time from a transit of the Sun across a given meridian to its next successive transit across the same meridian. Since the motion of the Sun is not uniform, apparent solar days vary in length throughout the year; the maximum deviation from a mean solar day amounts to less than a half minute in either direction.

Astronomical -- A solar day beginning at noon. The astronomical day may be based on either apparent solar time or on mean solar time and begins 12 hours later than the civil day of the same date.

Civil -- A solar day beginning at midnight. The civil day may be based on either apparent solar time or mean solar time; it begins 12 hours earlier than the astronomical day of the same date.

Mean solar -- The interval of time from a transit of the mean Sun across a given meridian to its next successive transit across the same meridian. The mean solar day is derived from the average length of the apparent solar day throughout the year. (See **time**, **mean solar**.)

DAY -- (continued)

Sidereal -- The interval of time from a transit of the true vernal equinox across a given meridian to its next successive transit across the same meridian. The length of the sidereal day is subject to slight irregularities due to small differences between the positions of the true equinox, which is affected by precession and nutation, and the mean equinox, which is affected by precession but not nutation. (See **time, sidereal; equinox, vernal**.)

Solar -- The interval of time from the transit of either the Sun or the mean Sun across a given meridian to the next successive transit of the same body across the same meridian. The term "day" is frequently used in connection with a particular period in one of the longer scales, as day of the month. In most cases, the term "date" is preferred.

DEAD VOLUME (transducer) -- The total volume of the pressure port cavity of a transducer at the rest position, i.e., when no stimulus is applied.

DEBUG -- To examine or test a procedure, routine or equipment for the purpose of detecting and correcting errors.

DECCA -- A long-range, ambiguous two-dimensional navigation system using continuous wave transmission to provide hyperbolic lines of position through RF phase comparison techniques from four transmitters. Frequency band 68 to 150 kHz.

DECIMAL TO BINARY CONVERSION -- The conversion of a decimal number to the equivalent binary number, i.e., a base 10 number to a base 2 number.

DECLINATION (astronomy) -- The angle at the center of the celestial sphere between the radius passing through a celestial body and the plane of the celestial sphere; measured by the arc of the hour circle between the celestial body and the Equator ("plus" when the body is north of the Equator and "minus" when south of it); corresponds to latitude on the earth and, with right ascension, forms a pair of coordinates which defines the position of a body on the celestial sphere.

DECODER -- A device for translating electrical signals into predetermined functions.

DECODER, BEACON -- A device for recovering any intelligence applied to the pulse train of the radar transmitter. Generally, a multitapped delay line is the basic element of the decoder. The delay line serves to establish coincidence between a series of radar pulses in an interrogation or command control code.

DECOMMUTATOR -- Equipment for separation, demodulation or demultiplexing commutated signals.

DECREMENT -- 1. The quantity by which a variable is decreased. **2.** In some computers, a specific part of an instruction word.

DEEPENING -- A decrease in the central pressure system on a constant-height chart, or an analogous decrease in height on a constant-pressure chart; the opposite of filling. Usually applied to a low rather than a high, although technically acceptable in either sense. The deepening of a low is commonly accompanied by the intensification of its cyclonic circulation, and the term is frequently used to imply the composite process. Deepening can be quantitatively expressed in at least two ways: as the time rate of central pressure decrease, or as that component of the pressure tendency at any fixed point that is attributable neither to the motion of the pressure system relative to that point nor to the diurnal influence of atmospheric tides.

DEFINITION -- The clarity, fidelity, sharpness, resolution and brilliancy of an image.

Optical -- The accurate concentration by the lens of the light from a point in an object to the corresponding point in the objects image without spreading to adjacent parts. Expressed numerically by a figure for the extent of this spread, i.e., the diameter of the circle of confusion. Preciseness of definition depends on the design of the lens, the accuracy of its manufacture, the accuracy with which the lens-to-film distance is adjusted in the camera and, in the case of a film camera, the exactitude with which the film lies flat and in the focal plane.

DEFLECTION OF THE VERTICAL -- The angle at a point on the earth (geoid) between the vertical (direction of the plumb line) and the direction of the normal to the spheroid of reference through the point; often called "deflection of the plumb line" or "station error". Equal also to the angle between the tangents to the geoid and the spheroid and the same as the topographic deflection corrected for the effects of isostasy.

DEGAUSS -- To erase a magnetic tape by applying an alternating magnetic field to it; demagnetize.

DELAY, AUTOMATIC VOLUME CONTROL -- Automatic volume control which is designed to react only on signals which exceed a certain predetermined value.

DELAY LINE -- 1. A device capable of retarding pulses by a fixed time interval, by a character or by a group of characters. **2.** A special microwave transmission line or energy storage device used to control the length of microwave pulses or to establish coincidence between a series of pulses in a pulse train (as in a radar beacon decoder) and simulate a real, long-line transmission line.

DELTA (δ) -- The phase angle between the two linearly polarized components, E_Φ and E_θ of an electric wave.

DELTA PRIME (δ') -- The phase angle between the two circularly polarized components, E_{RH} and E_{LH}, of an electric wave.

DEMODULATION -- The process of retrieving an original signal from a modulated carrier wave.

DEMODULATION, ENHANCED CARRIER -- An amplitude-demodulation system in which a synchronized local carrier of the proper phase is added to the demodulator. This has the effect of materially reducing the distortion produced in the demodulation process.

DENSITY -- The ratio of any quantity to the volume it occupies; i.e., atmospheric density is the ratio of atmospheric mass to the volume it occupies; the reciprocal of specific volume (same for flux density, electron density, etc.).

Base -- **1.** The density of a processed film from which the emulsion has been removed. **2.** The density of an unexposed, undeveloped, fixed-out film; used for government specification compliance tests.

Packing (Computer) -- The number of units of useful information contained within a given linear dimension, usually expressed in units per inch; the number of binary digit magnetic pulses stored on a tape or drum, per linear inch, on a single track by a single head.

Photographic -- The logarithm ($\log_{10}$) of the reciprocal of the fraction of the incident light transmitted.

DEPARTURE (plane surveying) -- The orthographic projection of a line on an east-west axis of reference. The departure of a line is the difference of the meridian distances or longitudes of the ends of the line. This is east or positive (sometimes called the "easting") for a line whose azimuth or bearing is in the northeast or southeast quadrant and is west or negative (sometimes called the "westing") for a line whose azimuth or bearing is in the southwest or northwest quadrant.

DEPENDENT LINEARITY -- A manner of expressing nonlinearity errors as the deviation from a desired straight line or fixed slope and/or position.

DEPTH OF FIELD -- The distance between the points nearest and farthest from the camera which form an acceptably sharp image on the focal plane.

DERIVATIVE DATA -- Data which has been derived from other data by mathematical techniques.

DERIVED GUST VELOCITY -- The maximum sharp-edged gust that would produce a given acceleration on a particular airplane flown in level flight at the design cruising speed of the aircraft and at a given air density. The ratio of derived gust density to effective gust velocity is not constant but is on the order of 2:1.

DESIGN IF BANDWIDTH -- The information bandwidth required for system performance.

DESTRUCT CRITERIA (safety) -- Predetermined limits of pertinent performance parameters beyond which the vehicle cannot be allowed to fly without violating the boundaries of its predetermined flight test area.

DESTRUCTIVE READ (computer) -- To take information from a storage device and thereby destroy the information in that device.

DESTRUCT RECEIVER (safety) -- Generally two modes: in the first mode a 400-MHz receiver is included in the missile and can operate either command or fail-safe for flight termination; in the second system, the missile guidance intelligence receiver is used to signal flight termination.

DESTRUCT TRANSMITTER (safety) -- Generally two modes: for command systems, a 400-MHz transmitter with superimposed audio tones for intelligence to the missile to perform flight termination; for fail-safe systems the transmitter above may be used, but the missile ground intelligence transmitter can also be converted to employ the same system. In the latter mode, an override switch can be activated to cause modification of missile intelligence which results in flight termination.

DESTRUCTOR (safety) -- Any explosive device which destroys the propulsion capability without necessarily destroying the missile**.**

DETECTOR --

Balanced -- Demodulator for frequency-modulation systems. In one form, the output consists of the rectified difference of the two voltages produced across two resonant circuits (one circuit being tuned slightly above the carrier frequency and the other slightly below).

Ratio -- An FM discriminator which uses the ratio of two intermediate-frequency (IF) voltages whose relative magnitudes are a function of frequency, rather than the difference of those potentials as in the case of the Armstrong discriminator circuit.

Regenerative -- A demodulator whose gain or conversion ratio is increased by the addition of positive feedback or regeneration at the carrier frequency. The sensitivity, small-signal selectivity, and distortion are increased over those found in a detector without regeneration.

Switch -- A detector which extracts information from the input waveform only at instants determined by a selector pulse.

DEVIATION -- The algebraic difference between a given value and its corresponding central value.

Frequency -- The peak difference between the instantaneous frequency of the modulated wave and the carrier frequency. The extent of deviation is proportional to the amplitude of the modulating signal.

Phase -- The peak difference between the instantaneous phase of the. modulated wave and the carrier frequency. The extent of deviation is proportional to the amplitude of the modulating signal.

Residual -- Modulation due to noise and/or distortion in the transmitter.

DEVIATION DISTORTION -- Distortion in an FM receiver caused by inadequate bandwidth, amplitude modulation rejection, or discriminator linearity.

DEVIATION RATIO -- (See **modulation index**.)

PCM/FM -- In PCM systems, the ratio of the peak-to-peak carrier deviation to the bit rate.

DEWPOINT -- 1. The temperature at which a given parcel of air must be cooled at constant pressure and constant water-vapor content for saturation to occur. When this temperature is below 0°C, it is sometimes called the frost point.
2. The temperature at which the saturation vapor pressure of the parcel is equal to the actual vapor pressure of the contained water vapor.

DIAGNOSTIC ROUTINE -- A computer routine used to locate computer malfunctions or program mistakes.

DIAGRAM -- A schematic representation of a sequence of operations or routines. (See **flow chart**.)

DIAPHRAGM --

Optical -- A method of controlling the amount of light which passes through a lens by varying the effective lens aperture; usually accomplished by either an iris diaphragm or a slotted disc of fixed size.

Transducer -- A dividing membrane widely used as the force-summing member in pressure transducers

DIFFERENTIAL ANALYZER -- An analog computer designed and used primarily for solving differential equations.

DIFFERENTIAL FLUTTER -- Speed change errors occurring at different magnitudes or frequencies across the width of a magnetic tape.

DIFFUSE FRONT -- A front across which the characteristics of wind shift and temperature change are weakly defined.

DIFFUSION -- In photography, the scattering or dispersion of light when reflected from a rough surface or when passed through such media as ground glass or opal glass.

DIGIT -- One of the ideographic characters (0 or 1 through 9) used to designate a quantity smaller than "n" for a base “n” number system.

DIGITAL DATA -- Data represented in discrete, discontinuous form, as contrasted with analog data represented in continuous form. Digital data is usually represented by means of coded characters, e.g., numbers, signs, symbols, etc.

DIGITAL MAGNETIC TAPE RECORDING -- A method of recording binary coded information using two discrete flux levels.

DIGITAL OUTPUT (transducer) -- Transducer output in which the magnitude of the stimulus is in the form of a series of discrete quantities which represents digits in a system of notation. Distinguished from analog output.

DIGITAL RESOLUTION -- The value of the least significant digit in a digitally coded representation.

DIGITIZE -- 1. To assign digital numbers to characters and words according to fixed rules of ordering. **2.** To convert from analog to digital form.

DIGITIZER -- A device which converts an analog measurement of a continuous physical variable into a numerical value; analog-to-digital converter.

DIPOLE -- A straight radiator, usually fed at the center, that produces a maximum of radiation in the plane normal to its axis. The length specified is the overall length.

DIRECTION -- In surveying and mapping, the angle between a line or plane and an arbitrarily chosen reference line or plane. At a triangulation station, observed horizontal angles are reduced to a common initial and termed "horizontal directions". Usually 0° is placed first and the other directions arranged in increasing clockwise order.

DIRECTION ANGLE -- The angle between the antenna baseline and a line connecting the center of the baseline with the target.

DIRECTION COSINE -- The cosine of the angle between the baseline and the line from the center of the baseline to the target.

DIRECTION OF POLARIZATION -- For a linearly polarized wave, the direction of the electric vector.

DIRECTIONAL COUPLER -- A waveguide device which extracts a fixed small fraction of the energy flowing in one direction in the waveguide line.

DIRECTIVITY DIAGRAM (antenna) -- In polar or Cartesian coordinates, a curve representing a quantity proportional to the gain of an antenna in the various directions in a particular plane or cone.

Horizontal -- The representation of the gain in the different directions of a horizontal plane or, if necessary, in the different directions of a plane slightly inclined to the horizontal.

DIRECTIVITY OF ANTENNA -- The ratio of the maximum field intensity to the average field intensity at a given distance, implying a maximum value.

DIRECT RECORDING -- A method of recording on magnetic tape using high-frequency bias in which the electrical input signal is delivered to the recording head in unaltered form.

DIRECT-WRITE RECORDER -- A strip chart recorder which produces a readable record without further processing. A recording instrument producing real-time pen-etched-on-roll paper displays. Also called "quick-look recorder".

DISCRIMINATOR, FM -- A device which converts variations in frequency to proportional variations in voltage or current.

DISCRIMINATOR TUNING UNIT -- A device which tunes the discriminator to a particular subcarrier.

DISK STORAGE (computer) -- An information storage device which uses magnetic recording on flat rotating disks.

DISPERSION -- Separation of an electromagnetic wave, by frequency, into components having slightly different directions or velocities. A wavefront is dispersed when it passes obliquely through an interface at which speed changes vary for different frequencies. Refracting dispersion separates frequencies in accordance with the corresponding refractive indices. A velocity dispersion will occur, without refraction, during passage of a wavefront through any medium in which the refractive index is frequency dependent. A wavefront may also be dispersed by diffraction grating, which separates according to actual wavelength.

Optical -- The separation of a single ray of white light into a group of colored rays by a glass, prism or similar optical device.

DISPLACEMENT -- The change in position of a body or point with respect to a specified reference point. When no reference frame is specified, a reference frame fixed with respect to the earth is assumed.

DISPLAY UNIT -- A device which provides a visual representation of data.

DISTANCE MEASURING EQUIPMENT (DME) -- The slant range determining equipment used in COTAR, AZUSA, etc. Range is determined by applying modulation to the carrier and measuring the phase delay as the signal is propagated to a transponder, returned on an offset carrier, and received on the ground. Several modulation frequencies are used to allow ambiguities to be

resolved to some predetermined range. The highest modulation frequency used determines the system resolution.

DISTOMAT -- (See **tellurometer**.)

DISTORTION -- Undesired change in waveform.

Delay -- Distortion due to the frequency variation of the system.

Deviation -- Distortion in an FM receiver caused by inadequate bandwidth, amplitude-modulation rejection, or discriminator linearity.

Fortuitous -- In teletypewriter transmission systems, the random displacement of mark/space and space/mark transitions. Random distortion of telegraph signals, such as that commonly caused by interference as opposed to distortion which is peculiar to the equipment.

Frequency -- A term commonly used for that form of distortion in which the relative magnitude of the different frequency components of a complex wave are changed in transmission.

Harmonic -- Nonlinear distortion characterized by the appearance in the output of multiples of the fundamental when the input wave is sinusoidal.

Nonlinear -- Distortion caused by deviation from a proportional relationship between specified measures of the output and input of a system. The related measures need not be output and input values of the same quantity; e.g., in a linear detector, the desired relation is between the output signal voltage and the input modulation envelope.

DISTURBANCE -- 1. In general, any agitation or disruption of a steady state. **2.** In meteorology, this has several rather loose applications: **a**. used for any low or cyclone, but usually one that is relatively small in size and effect; **b.** applied to an area where weather, wind, pressure, etc., show signs of the development of cyclonic circulation; **c.** used for any deviation in flow or pressure that is associated with a disturbed state of the weather, i.e., cloudiness and precipitation; and **d.** applied to any individual circulatory system within the primary circulation of the atmosphere.

DITHERING (transducer) -- The application of intermittent or periodic acceleration forces sufficient to minimize the effect of static friction within the transducer without introducing other errors.

DIVERSITY RECEPTION -- A method of radio reception used to minimize the effects of fading, where a resultant signal is obtained by combination and/or selection of two or more sources of received-signal energy which carry the same modulation or intelligence, but which may differ in strength or signal-to-noise ratio at any given instant. Diversity reception may employ frequency, polarization or space diversity.

DOPPLER EFFECT -- A principle of physics stating that, as the distance between a source of constant vibration and an observer diminishes or increases, the received frequencies are greater or less.

DOPPLER FREQUENCY -- (See **Doppler shift**.)

DOPPLER RANGING (DORAN) -- A continuous wave trajectory measuring system which uses the Doppler shift to measure the distance between a transmitter, missile transponder, and several receiving stations. From these measurements, trajectory data are computed. In contrast to similar systems, DORAN circumvents the necessity of continuously recording the Doppler signal by performing the distance measurements with four different frequencies simultaneously.

DOPPLER SHIFT -- A variation in the frequency of a wave reaching an observer or a system, caused by a change in distance or range between the source and the observer or the system during the interval of reception.

DOPPLER VELOCITY AND POSITION (DOVAP) -- A continuous wave trajectory measuring system using the Doppler shift caused by a target moving relative to a ground transmitter and a series of receiving stations. The transmitter interrogates a frequency doubling transponder and the output is received at three or more receiver sites for comparison with the interrogation frequency. This process determines ellipsoids of position for each receiving station. The intersection of the ellipsoids provides position data as a function of time.

DOUBLE AMPLITUDE -- In a field of vibratory acceleration this term is employed to indicate the total, or peak-to-peak, dimensional displacement of a vibrating structure.

DOUBLE IMAGE -- Appears as a strong image with a weaker image displaced in one direction and nearly superimposed upon it; usually, images reflected from two surfaces in the optical path.

DOUBLE LOCAL OSCILLATOR (DLO) -- An oscillator mixing system which generates two RF signals accurately spaced a few hundred cycles apart and

mixes these signals to give the difference frequency which is used as the reference. This equipment is employed in an interferometer system to obtain a detectable signal containing the phase information of an antenna pair and the reference signal to allow removal of the phase data for use.

DOUBLE PRECISION -- Retention of twice as many digits of a quantity as the computer normally handles; e.g., a computer whose basic word consists of 10 decimal digits is called to handle 20 decimal digit quantities by keeping track of the 10-place fragments of lower order.

DOUBLET -- A lens consisting of two components, each of which in turn may be composed of several lenses.

DOUBLE-THEODOLITE OBSERVATION -- A technique for making winds-aloft observations in which two theodolites located at either end of a base line follow the ascent of a pilot balloon. Synchronous measurements of the elevation and azimuth angles of the balloon, taken at periodic intervals, permit computation of the wind vector as a function of height.

DOVAP ELSSE -- Electronic skyscreen equipment (ELSSE) which uses the DOVAP transponder as a signal source. This system is also called "beat-beat DOVAP."

DOWNTIME -- The period during which a computer or other equipment is malfunctioning due to machine failure; contrasted with available machine time, idle time or standby time.

DROPOUT -- Any discrete variation in signal level during the reproduction of magnetic tape recorded data which results in a data reduction error.

DROPSONDE (parachute radiosonde) -- A radiosonde which is dropped by parachute from an aircraft for the purpose of obtaining a sounding of the atmosphere below.

DRUM CAMERA -- A camera that uses a drum to transport the film through the focal plane in a continuous motion.

DRUM, MAGNETIC -- A rotating cylinder on whose magnetic coating information is stored in the form of magnetized dipoles, the orientation or polarity of which is used to store binary information.

DRY RUN (safety) -- A condition in which all elements of a test are on station and proceeding as in a regular test except that the firing pulse is not permitted to initiate the round.

DUCTING -- The trapping of an electromagnetic wave, in a waveguide action, between two layers of the Earth's atmosphere or between a layer of the atmosphere and the Earth's surface. Ducting is likely to occur where the refractive index gradient exceeds 48 N-units per 1,000-feet altitude. (See **refractivity, total refraction**.)

DUMMY RUN (safety) -- A condition in which critical and desired functions are operated and other functions pertaining to a firing are simulated.

DUMP -- 1. A copy or printout of all or part of the contents of a particular storage device. **2.** To copy or transfer contents from one storage area or device to another. **3.** Rotation of an instrument, such as a camera or telescope, 180° around the horizontal axis passing through zenith, followed by rotation 180° around the vertical axis. The optic axis should then assume the same spatial orientation it had before dumping. (See plunge.) **4.** In missile flight safety, a form of aerodynamic destruct by which the missile is commanded to dive to the surface to terminate its flight.

DUODECIMAL NUMBER SYSTEM -- A decimal system using the equivalent of the decimal number 12 as a radix.

DUPE NEGATIVE -- Duplicate; a film negative produced from a positive. A dupe negative is used for producing prints which are, in effect, duplicates of prints made from the original negative.

DUPLEXER -- A fast acting switch that makes it possible to use a common antenna for receiving and transmitting. It must be capable of acting fast enough to disconnect the receiving apparatus from the antenna during the transmitted pulse and to disconnect the transmitter when time signals are being received.

DUTY CYCLE (radar) -- The portion of time that RF energy is radiated; equal to pulse width times pulse repetition frequency.

DYNAMIC CALIBRATION -- A calibration technique in which the measurand varies with time or frequency in a known manner, and the output is recorded as a function of time or frequency to determine such characteristics as frequency response, damping ratio, and/or natural frequency and rise time.

DYNAMIC HEIGHT -- The height of a point in the atmosphere expressed in a unit proportional to the geopotential at that point; geodynamic height. Since the geopotential at altitude z is numerically equal to the energy expended when a particle of unit mass is lifted from sea level up to this height, the dimensions of dynamic height are those of potential energy per unit mass.

DYNAMIC PRESSURE -- The difference between the static pressure at a point and the total pressure at the stagnation point of the same streamline; a measure of the kinetic energy of a fluid.

DYNAMIC RANGE (recorder/reproducer system) -- The range which extends from the systems minimum signal detectable level to the maximum level acceptable as data. In a direct-record system, the minimum signal is determined by the reproduce amplifier noise output in the data bandwidth and by zero modulation tape noise. The maximum level is determined by the level of record signal necessary to saturate the tape. Saturation level depends upon the amount of distortion -- harmonic and intermodulation -- acceptable in the output signal. For FM-record systems, the minimum detectable signal depends on tape dropouts and speed change error effects, as well as the discriminator input and output circuits. Maximum output signal depends upon record amplifier, discriminator, and output amplifier linearity and stability at maximum deviation.

DYNAMIC RESPONSE -- (See **frequency response**.)

DYNAMIC TEST -- A test performed on accelerometers to gather information on the overall behavior, frequency response and/or natural frequency of the device.

E

ECCENTRICITY OF CIRCLE -- The distance between the center of a figure of a graduated circle and its center of rotation, usually expressed in terms of its equivalence in seconds of arc on the circle. It may be made quite small by the instrument-shop adjustment. Its effect on an observed direction is eliminated by reading the circle at equidistant points around its circumference.

ECHO BOX -- A device for feeding pseudo-standard signals back to the radar receiver. After a small part of the primary pulse is fed into the echo box, the box will ring for a period of time. This energy is loosely coupled back into the radar receiver through the antenna. The range at which the signal disappears is indicative of the overall performance of the system; the greater the range, the better the performance.

ECHO (radar) -- That portion of the radar's transmitted RF energy which is reflected from a target.

ECLIPTIC -- The great circle of the celestial sphere traced by the plane of the Earth's orbit (path of center of gravity of earth-Moon system). The ecliptic represents very closely, but not exactly, the apparent path of the Sun in the sky. The points at which the ecliptic intersects the celestial equator are the equinoxes, and the angle of intersection is the obliquity of the ecliptic.

E CORE -- The configuration of laminations used in certain inductive transducers which resembles the form of the capital Roman letter E.

EDDY -- 1. By analogy with a molecule, a "glob" of fluid within the fluid mass that has a certain integrity and life history of its own; the activities of the bulk fluid being the net result of the motion of the eddies. The concept has been applied with varying results to phenomena ranging from the momentary spasms of the wind to storms and anticyclones. **2.** Any circulation drawing its energy from a flow of much larger scale, and brought about by pressure irregularities as in the lee of a solid obstacle.

EDGE FOG -- A darkening of paper or film borders through the action of chemicals or light.

EFFECTIVE PROPAGATION VELOCITY -- The actual path length obtained by multiplying velocity times the transit time for a ray path; time-averaged velocity. A path-averaged velocity would allow for path curvature and meteorological variation along the path, but not for time variation. A direction-averaged velocity (assuming a straight ray path) allows only for meteorological variation along the approximate path. An altitude-averaged velocity assumes horizontal or

spherical stratification of the atmosphere, it does not allow for path curvature or time variation.

EFFECTIVE WAVELENGTH -- The wavelength corresponding to the effective propagation velocity and the observed frequency.

EFFECTOR -- The mechanical means (an aerodynamic surface, a gimbaled motor or an auxiliary jet) of maneuvering a missile during flight.

ELECTRIC ACCOUNTING MACHINE (EAM) -- A term used to designate most punch-card equipment. (See **electronic data processing machine**.)

ELECTROMAGNETIC CHARACTERISTICS (of equipment) -- The essential technical characteristics required for electromagnetic compatibility analysis and frequency engineering. Essential characteristics are listed on DD Form 1494, Application for Frequency Allocation.

ELECTROMAGNETIC COMPATIBILITY (EMC) -- When electronic equipment is performing its individually designed function in a common electromagnetic environment without causing or suffering unacceptable degradation due to interference with other equipment.

ELECTROMAGNETIC EFFECTS -- The results (usually undesirable) of electromagnetic radiation on materiel or personnel.

ELECTROMAGNETIC ENVIRONMENT -- The power flux density, energy or power spectral distribution as a function of time, frequency and free-space coordinates.

ELECTROMAGNETIC INTERFERENCE (EMI) -- Any undesired electromagnetic energy which interrupts or degrades effective performance of electronic equipment.

ELECTROMAGNETIC PULSE (EMP) -- The electromagnetic radiation from a nuclear explosion caused by Compton-recoil electrons and photo electrons from photons scattered in the materials of the nuclear device or in a surrounding medium. The resulting electric and magnetic fields may couple ,with electrical/electronic systems to produce damaging current and voltage surges.

ELECTROMAGNETIC RADIATION -- Radiation made up of oscillating electric and magnetic fields. Includes gamma radiation, X-rays, ultraviolet, visible, and infrared radiation, and radar and radio waves.

ELECTROMAGNETIC SPECTRUM (radio frequency spectrum) -- The continuous range of electromagnetic radiations used in telecommunications, the frequency of which extends from 3 kHz to 3,000 GHz; or a wavelength of 100 km to 0.1 mm, respectively.

ELECTRONIC COUNTERMEASURES (ECM) -- That division of electronic warfare involving actions taken to prevent or reduce an enemy's effective use of the electromagnetic spectrum. Electronic countermeasures include electronic jamming and electronic deception.

ELECTRONIC DATA PROCESSING MACHINE (EDPM) -- Computing equipment whose operation mainly depends upon small currents through vacuum tubes, transistors, etc.

ELECTRONIC MISSILE ACQUISITION (EMA) -- A crossed baseline interferometer system which derives azimuth and elevation angle information. This system was designed as an acquisition aid for cinetheodolites. The EMA equipment operates on the DOVAP transponder frequency.

ELECTRONIC SKYSCREEN EQUIPMENT (ELSSE) -- An active range safety system operating on the interferometer principle. It is an ambiguous, single-baseline, continuous wave phase-comparison system designed to track the missile's telemetry-transmitted signal. Its angular output data is presented on dials or as dc analog voltages where phase changes resulting from angle changes of less than 10° can be read directly as position differences with a negligible error for short distances.

ELECTRONIC WARFARE (EW) -- Military action which prevents hostile use, or retains friendly use of the electromagnetic spectrum. There are three divisions within electronic warfare; electronic warfare support measures, electronic countermeasures and electronic counter-countermeasures.

ELECTROTAPE -- An electronic distance measuring device. (See **tellurometer**.)

ELEMENT (timing) -- The basic components or characters making up a time code. Codable elements are called "code digits". Uncodable elements are called "index" or "reference markers".

ELEVATION -- 1. The vertical distance of a point above or below a reference surface or datum; the corresponding angle from some origin on a reference surface to the point. **2.** A measure (or condition) of height, especially with respect to the height of a point on the Earth's surface above a reference plane (usually mean sea level). The term "'altitude", e.g., high-altitude station, and the general term "height" also are used in this sense. **3.** In the fundamental horizontal control survey of this country, the datum for elevations is mean sea level.

Orthometric -- A preliminary elevation to which an orthometric correction has been applied.

Standard -- An adjusted elevation based on the Sea Level Datum of 1929.

ELLIPSOID (geodetic) -- (See **spheroid**.)

ELLIPSOID OF CONCENTRATION -- The 90 percent probability volume for a cinetheodolite solution; also called "ellipsoid of error".

ELLIPTICAL POLARIZATION (antenna) -- A term describing the polarization of an antenna designed to efficiently transmit and/or receive an electromagnetic wave for which the electric and/or the magnetic field vector at any point describes an ellipse.

ELLIPTICAL SYSTEM -- A system in which ellipsoids of position are determined from time or phase summation relative to two or more fixed stations which are the foci for the ellipsoids. In a three dimensional system, the ellipses become ellipsoids of position.

ELLIPTICALLY POLARIZED WAVE -- An electromagnetic wave for which the electric and/or magnetic field vector at a point describes an ellipse. (Note: This term is usually applied to transverse waves.)

ELLIPTICITY RATIO -- The ratio of the major axis to the minor axis of an ellipse; as a measure of elliptical polarization, the power ratio of the maximum to the minimum electric vectors of an elliptically polarized antenna. This ratio is sometimes expressed as an axial ratio, which is the reciprocal of the ellipticity ratio. (See **flattening of the earth**.)

EMC ANALYSIS -- An investigation of the electromagnetic compatibility (EMC) of material or concepts in the intended electromagnetic environment.

EMERGENCY FLIGHT TERMINATION PERIODS (safety) --

Period one -- The period which begins at lift-off and ends when the missile reaches that point in its flight when it first becomes capable of impacting outside the impact limit lines.

Period two -- The period which begins when the vehicle reaches that point in its flight when it first becomes capable of impacting outside the impact limit lines and ends when it reaches that point in its flight when it no longer has the capability of impacting on any populated land mass.

Period three -- The period which begins when the vehicle reaches that point in its flight when it no longer has the capability of impacting on any populated land mass and ends when all engine thrust terminates.

EMISSION DESIGNATOR -- A cluster of symbols which characterizes an RF transmission by depicting the type of modulation of the main carrier, the type of transmission and the supplementary characteristics. Whenever the full designation of an emission is necessary, the symbol for that emission shall be preceded by a number indicating in kilohertz the necessary bandwidth of the emission.

EMISSION, SPURIOUS --

Antenna conducted -- Spurious signals detected in the antenna transmission line system of an RF transmitter.

Antenna radiated -- Spurious signals radiated from the antenna system of an RF transmitter.

ENABLE -- To activate a circuit by the removal of a suppression signal.

ENCODER -- A device for coding. (See **coder**.)

END DEVICE; END INSTRUMENT -- (See **transducer**.)

END-OF-BEAM RIDING (safety) -- Occurs when missile leaves beam due to aerodynamic effects or cessation of internal missile functions.

END-OF-FILE MARK (magnetic tape) -- A code which signals that the last record of a file has been read.

END OF MESSAGE -- The specific set of characters which indicates the termination of a message.

END OF RECORD (magnetic tape) -- A length of blank tape approximately 3/4 inch long which is preceded by a 7-bit check sum. Also called "record gap."

END POINTS (transducer) -- The outputs at the upper and lower limits of the specified transducer range.

ENTRANCE PUPIL (optics) --'The image of the aperture stop as viewed from the object.

ENVIRONMENTAL CONDITIONS -- External conditions (shock, vibration, temperature, etc.) to which a device may be exposed during shipping, storage, handling, and operation and which may adversely affect its performance or reliability.

ENVIRONMENTAL DATA -- Information describing the environment in or above the area where an operation takes place. This includes data about the weather, atmosphere, electromagnetic spectrum, nuclear energy levels, land and water masses overflown.

EPHEMERIS -- A tabular statement presenting positions and related data for celestial bodies for given epochs (dates) at uniform intervals of time. Also publications containing such data for a number of celestial bodies. Such a publication is the American Ephemeris and Nautical Almanac. This periodical contains for specified moments of time the numerical values of coordinates of the principal celestial bodies referred to circles whose positions are independent of the diurnal rotation of the earth; also, the elements of the positions of the reference circles, and numbers used in computing the effects upon which those coordinates of changes in the position of-an observer, and, in general, all those phenomena relating to the heavenly bodies which may be regarded as functions of time. While it is customary to use the singular form "ephemeris" to designate a publication containing data relating to a number of celestial bodies, where specific mention is made of those bodies, the plural form "ephemerides" is used; e.g., the ephemerides of the planets. Accordingly, when specific mention is made of a single body, the singular form is used; e.g., the ephemeris of the Sun.

EQUATOR --

Astronomic -- The line on the surface of the earth whose astronomic latitude at every point is 0°. (Also termed "terrestrial equator".) Due to the deflection of the plumb line, the astronomic Equator is not a plane curve. However, the verticals at all points on it are parallel to one and the same plane, the plane of the celestial Equator; i.e., the zenith at every point on the astronomic equator lies in the celestial Equator.

EQUATOR -- (continued)

Celestial -- The great circle on the celestial sphere whose plane is perpendicular to the axis of rotation of the earth. In astronomic work, because parallel lines meet at infinity, the plane of the celestial Equator is sometimes assumed to pass through the point of observation.

Geodetic -- The circle on the spheroid midway between its poles of revolution. The geodetic equator is the line of 0° geodetic latitude from which geodetic latitudes are reckoned, north and south, to 90° at the poles. The plane of the geodetic equator cuts the celestial sphere in a line coinciding with the celestial equator, because the axis of the spheroid of reference is, by definition, parallel to the axis of rotation of the earth.

EQUIVALENT FOCAL LENGTH -- The distance along the principal axis from the second node of the optical system to the image plane for an object at infinite distance.

ERASE -- 1. To remove data from storage permanently. **2.** To replace data in storage by blanks or zero characters.

ERROR -- 1. A general term to indicate that a data value is not correct. **2.** A specific term for the amount of uncertainty associated with the measurement. **3.** The algebraic difference between the indicated value and the true value of the measurand; often expressed in percent of the full-scale output.

Bias -- An error that remains constant; an error that is consistently in the same direction.

Boresight -- **1.** The linear displacement between two parallel lines of sight. **2.** The difference between the actual target and the center of the RF axis assuming that the optical axis and the RF axis are parallel. (See **parallax**.)

Collimation -- The angular error in magnitude and direction between two nominally parallel lines of sight.

Combined -- A term used to specify the total error of an instrument in the presence of adding or interacting parameters.

Erratic -- An error caused by an incomplete element in an instrument, for example: backlash in a gear train. An error that is neither characterized by its regular (systematic) nor its random appearance.

ERROR -- (continued)

Graduation -- Systematic errors made in marking the output indicator of a measuring instrument.

Huge -- An error that is so much larger than expected that it can with some certainty be called a mistake and the data, therefore, can be ignored.

Inherited -- The error in the initial values; especially the error inherited from the previous steps in a step-by-step procedure.

Interchannel time displacement -- The static and dynamic timing errors between simultaneous real-time events recovered from different tracks of a reproduced tape which result from tape skew, gap scatter and head stack azimuth misalignment and misplacement.

Personal -- Errors ascribable to the human element in a measuring system. Mistakes are not included here. Personal error can be systematic, erratic or random.

Probable -- The error whose probability of being exceeded is 50 percent.

Quantization -- The difference between actual values of information and the corresponding discrete values resulting from quantization.

Random -- The inherent imprecision of a given process of measurement; the unpredictable component of repeated independent measurements on the same object under uniform conditions; usually of an approximately normal (Gaussian) frequency distribution; other than systematic or erratic. errors and mistakes (sometimes called "short-period errors"). In analysis it is convenient to treat long-period errors as correctable bias and short-period errors as random errors. After correcting for the more obvious bias, it is customary to treat all remaining deviations from the mean, or mean trend, as random.

Roller path -- The sum total of errors arising from the bearing.

Rounding -- The error which results from deleting the less significant digits of a quantity and applying a correction to the part retained.

Standards (trunnion) -- The perpendicular deviation between the elevation and azimuth axes measured in the plane formed by these two axes.

ERROR -- (continued)

Systematic -- An error that is always a function of the magnitude of the phenomenon observed. When the error is constant or consistently in the same direction, it is called a bias.

Time base -- The dynamic timing errors in a single track of a reproduced tape resulting from differential instantaneous record/reproduce tape speed which is caused primarily by flutter and tape speed servo following error.

Truncation -- The error resulting from the use of only a finite number of terms of an infinite series, or from the approximation of operations in the infinitesimal calculus by operations in the calculus of finite differences.

Zero-set -- The error made in setting the reference index of an instrument: a bias error.

ERROR BAND -- 1. The maximum allowable error for a specified combination of parameters (usually expressed in percent of full scale). **2.** The band of allowable deviations from a specified reference line or curve caused by the transducer when measured over two consecutive calibration cycles, unless otherwise specified.

Acceleration -- The error band applicable when constant accelerations within a specified range of amplitudes are applied to a transducer along specified axes at room conditions.

Ambient pressure -- The error band applicable when the transducer operates over a specified range of ambient pressures.

ERROR CURVE -- A plot of the difference between the indicated and true values of the measurand versus the true value of the measurand.

ERROR SIGNAL -- A voltage, the magnitude of which is usually proportional to the difference between the actual and the desired position.

Radar -- Error signals obtained from selsyns and from automatic gain control circuits to control a servo system so that the result tends to correct the error.

EXCITATION ENERGY (transducer) -- The external electrical energy required for the proper operation of a transducer.

EXCLUSIVE OR (computer logic) -- The Boolean operator which gives a truth table value of true if only one of the two variables it connects is true. If both variables it connects are true, the value is false.

EXCURSION -- A single movement away from the mean position in an

oscillating or alternating motion.

EXECUTIVE ROUTINE -- That portion of a computer program which controls the execution of other routines.

EXERCISE HEAD (safety) -- A substitute warhead equipped with either an electronic intelligence system for transmitting or recording missile flight information or equipped with visual components for indicating functions such as fuze functioning, fuze arming, etc.

EXOSPHERE (region of escape) -- The outermost or topmost portion of the atmosphere. Its lower boundary is the critical level of escape, variously estimated at 500 to 1,000 km above the Earth's surface. In the exosphere, the air density is so low that the mean free path of individual particles depends upon their direction with respect to the local vertical (greatest for upward moving particles). It is only from the exosphere that atmospheric gases can, to any appreciable extent, escape into outer space.

EXPLOSIVE DESTRUCT (safety) -- A means of flight termination using an explosive charge to break the missile up into aerodynamically unstable pieces.

EXPOSURE INDEX -- A numerical value assigned to a sensitized material to facilitate exposure calculation.

EXTENDED RANGE DOVAP (EXTRADOP) -- A baseline extension of the DOVAP system which provides a coherent reference to the ground transmitter and all DOVAP receivers located beyond line of sight to the ground transmitter. The coherent reference is supplied by a cable and is multiplied up to the proper reference frequency.

EXTERNAL STORAGE -- A device outside the computer which can store information in a form acceptable to the computer, e.g., cards, tapes.

EXTREME METEOROLOGY -- In climatology, the highest and, in some cases, the lowest value of a climatic element observed during a given period or during a given month or season of that period. If this is the whole period for which observations are available, it is the absolute extreme.

F

FAHRENHEIT TEMPERATURE SCALE (°F) -- A temperature scale on which 32° is the freezing point and 212° the boiling point of water at sea level.

FAIL-SAFE (safety) -- A system used to initiate a sequence of events to minimize risk in case of malfunction, or one having the capability to perform a desired function despite the failure of any component.

FAIR (meteorological) -- Generally descriptive of pleasant weather conditions, with due regard for location and time of year. It is subject to popular misinterpretation, for it is a purely subjective description. When this term is used in U.S. Weather Bureau forecasts, it is meant to imply no precipitation, less than 0.4 sky cover of low clouds, and no other extreme conditions of cloudiness, visibility or wind.

FALSE PULSE GENERATOR -- A unit which supplies pulses for missing Pulse Amplitude Modulation (PAM) or Pulse Duration Modulation (PDM) channel pulses.

FAST LENS -- A lens that has a large relative aperture.

FEEDBACK -- The return of part of the output of a machine, process or system as input for the same or another phase, especially for self-correcting or control purposes.

F-FACTOR (transducer) -- The slope of the straight line from which nonlinearity is calculated. Given as microvolts output-per-volt excitation per unit stimulus.

FIDUCIAL MARKS -- 1. Index marks (frequently four) rigidly connected to the camera lens through the camera body and forming images on the negative which usually are related to the principal point of the optical system, e.g., center cross hair for the objective, reference mark for angular readings, and orientation marks for leveling. **2.** Internally generated identification marks on a film, two or more of which are generally used for orienting a film for reading and for determining the geometric center of the film.

FIELD --

Computer -- A set of one or more characters (not necessarily all lying in the same word) which is treated as a whole; a unit of information.

FIELD (continued)

Electric -- A general term used to designate electromagnetic phenomena which exists in the vicinity of either static or moving electric charges.

Electromagnetic -- A vector force field produced by the motion of electric charges. The electromagnetic field at a point is described by separate electric and magnetic force vectors; the complex relation between the two fields and the currents and charges producing them is given by the set of partial differential equations known as Maxwell's equations.

Electrostatic -- The vector force field set up in the vicinity of nonmoving electrical charges. The strength of this static field at a point is defined as the force per unit charge on a stationary positive test charge, provided the test charge is so small that it does not disturb the original charge distribution.

Punch card machine -- A set of one or more columns in each of a number of punch cards which is regularly used to report a standard item of information. For example: if columns 16 to 19 are regularly used to report weekly rate of pay, these columns would constitute a field.

FIELD INTENSITY (RF) -- The power flux density of electromagnetic waves passing through a surface normal to the direction of propagation.

FIELD OF VIEW -- 1. The solid angle in the object space for which objects can be acceptably viewed, photographed, or otherwise detected. **2.** (transducer)--The solid angle or the angle in a specified plane over which radial energy incident on a transducer is measured within specified tolerances.

FIELD STRENGTH (RF) -- The magnitude of the electric or magnetic field vector (E or H) at a given location resulting from the passage of radio waves.

FILE (computer) -- An organized collection of information directed toward some purpose.

FILE GAP (computer) -- An interval of space or time which indicates or signals the end of a file.

FILM BASE -- The flexible transparent material on which an emulsion is coated.

FILTER FACTOR -- The relative increase in exposure time required when an optical filter is used in taking a photograph.

FILTER SERVO -- (See **tracking filter**.)

FINE DATA CHANNEL -- The data channel which supplies accurate but ambiguous data as opposed to the course channel needed to resolve the ambiguity.

FIRST GUST -- The sharp increase in wind speed often associated with the early mature stage of a thunderstorm cell. It occurs with the passage of the discontinuity zone which is the boundary of the cold-air downdraft. The first gust can reach destructive speeds.

FIRST-ORDER WORD (control surveys) -- A triangulation scheme conforming to the following criteria: the average error of closure of the main-scheme triangles does not exceed 1 inch, the maximum error of closure of the main-scheme triangles does not exceed 3 inches, the error of closure in length on a measured baseline or on a line of adjusted first-order triangulation does not exceed 1/25,000 of the length of the line after the angle and side equations have been satisfied in the adjustment.

FIXED CAMERA -- A camera motion or still camera whose optical (principal) axis remains stationary throughout its operation.

FIXED POINT ARITHMETIC (computer) -- Arithmetic using a fixed location for the decimal or binary point in each number; contrasted with floating point.

FIXED POINT PART -- One of the two elements of the floating point representation of a number which is not the exponent or power of the base.

FLAG -- A symbol which marks or encloses a unit of information. (See, **sentinel**.)

FLARE -- Nonimage forming light reaching the image. Usually caused by reflection from the lens surfaces, lens barrel or reflecting surfaces within the barrel, shutter or lens mount. Flares may be concentrated or diffused.

FLAT FREQUENCY RESPONSE -- Response of a system to a constant amplitude function which varies in frequency. The response is flat if it varies within specified limits of amplitude; usually expressed in decibels from a reference quantity.

FLATTENING OF THE EARTH -- The ratio of the difference between the equatorial and polar radii of the earth (major and minor semiaxis of the spheroid) to its equatorial radius (major semiaxis). The flattening of the earth is the ellipticity of the spheroid and equals the ellipticity of an ellipse forming a meridional section of the spheroid. If a and b represent the major and minor

semiaxes of the spheroid, and f is the flattening of the earth, thus:

$$f = \frac{a - b}{a}$$

Also, the magnitude of the flattening is sometimes expressed by stating the numerical value of the reciprocal of the flattening. The flattening of the earth is also termed compression.

FLIGHT PATH -- The path of the center of gravity of a missile with reference to the earth.

FLIGHT PATH ANGLE -- A possible parameter which may be used as destruct criteria. The angle of the flight path can be allowed to make a specific reference angle.

FLIGHT SAFETY (safety) -- A philosophy and method by which missile testing can be performed in a reasonable and prudent manner without undue risk to personnel and private or public property.

FLIP-FLOP -- An electronic circuit having two states.

FLOATING POINT --- A form of number representation in which quantities are represented by a number multiplied by the number base raised to a power; i.e., the decimal number 397 can be written as 3.97×10^2 or 0.397×10^3.

FLOATING POINT ARITHMETIC -- Arithmetic using a variable location for the decimal or binary point in each number, where the location in each number depends upon the size of the number and its power of 10 or 2, i.e., 2.5 plus 2.1273×10^2 equals 2.1523×10^2.

FLOW CHART (digital computer programming) -- A graphical representation of a sequence of programming operations using symbols to represent such operations as compute, substitute, compare, jump, copy, read, write, etc. A flow chart is a more detailed representation than a diagram.

FLUID DAMPING -- (See **viscous damping**.)

FLUTTER -- 1. An instantaneous frequency deviation at a ratio of 10 Hz or higher caused by changes in speed during short intervals of 1/10 of a second or less.
2. A recurring speed variation in a tape drive of relativity low frequency. This condition is usually considered important when magnetic tape is used for audio or analog recording rather than digital recording.

FM DISCRIMINATOR -- A device which converts frequency variations to proportional variations in the amplitude of an electrical signal.

FM RECORDING (magnetic tape) -- A method of recording in which the input signal modulates a voltage-controlled oscillator, the output of which is delivered to the recording head.

FOCAL PLANE -- Any plane in an optical system where a real image is formed.

FOCAL PLANE SHUTTER (camera) -- A curtain-type shutter located just in front of the focal plane with various widths of slots and a spring tension to give different exposures.

FOCAL PLANE SHUTTER EFFECT -- The phenomenon resulting from an exposure of a moving object or objects during a single pass of a focal plane shutter. In the case of a single moving object, the resulting image may be slanted, elongated or compressed.

FOLDED OPTICS -- An optical system employing mirrors or prisms to change the direction of light. (See **catadioptric**.)

FOOT --

American survey -- A unit of length equaling 0.3048006096 international meter which is used by the U.S. Coast and Geodetic Survey for data, expressed in feet, derived from and published as a result of geodetic surveys. This unit is based on the relationship: 1 meter=39.370 inches exactly.

International -- A unit of length equaling 0.3048000000 international meter which was adopted 1 January 1959 for use in precise measurements for science and technology. This unit is based on the relationship: 1 inch=25.4 millimeters exactly.

FORCED DEVELOPMENT (photography) -- Continued development beyond the normal time in an effort to obtain or bring out more detail. Often used where underexposure has taken place or as a means of increasing the film speed.

FORESIGHT (geodetic) -- 1. A sight on a new survey point made in connection with the determination of the new point or a sight on a previously established point used to close the circuit. **2.** A reading on a leveling rod held on a point whose elevation it is intended to determine.

FORMAT -- A predetermined arrangement of characters, fields, lines, punctuation, page numbers, etc.

FORMULA TRANSLATION (FORTRAN) -- A programming language designed for problems that can be expressed in algebraic notation, allowing for exponents and up to three subscripts. The routine on a given machine that accepts a source program written in FORTRAN language and produces a program written in machine language is known as the FORTRAN compiler.

FOUR-HORN FEED -- A cluster of four rectangular horn antennas used as the radiating (and receiving) elements of parabolic or lens-type radar antennas. The four segments of the horn assembly define the four quadrants of information for direction to target sensing. Used on monopulse-type radar systems such as the AN/FPS-16. (See **horn**.)

FRAME-- 1. In time division multiplexing, one complete commutator revolution. **2.** In PCM systems, an integral number of words which includes a single signal.

Photography -- Each of the exposures on a strip of film; one of a sequence of pictures. An aperture plate or similar camera part defines the dimensions. Cameras are often classified according to the following frame sizes:

Frame	Size
half frame 16mm	0.125" x 0.43"
half frame 35mm	0.25" x 1.00"
half frame 70mm	1.156" x 2.25"
full frame 16mm	0.317" x 0.45"
full frame 35mm	0.67" x 1.00"
full frame 70mm	2.25" x 2.25"
double frame 35mm	1.00" x 1.47"

Telemetry -- **1.** In Pulse Code Modulation (PCM) systems, one complete sampling of words or channels of information at a given rate. **2.** In time division multiplexing, one complete commutator revolution.

Television -- The picture area scanned during one complete cycle of the vertical timebase.

FRAME PULSE SYNCHRONIZATION -- Synchronization of the local channel rate oscillator by comparison and phase-lock with the separated frame synchronizing pulses.

FRAME RATE --

Photographic -- Number of exposures per time interval normally referred to as frames-per-second.

FRAME RATE (continued)

Telemetry -- The frequency derived from the period of one frame.

FRAME SYNCHRONIZATION SIGNAL -- 1. In Pulse Amplitude Modulation (PAM), uniquely coded pulses or an interval to mark start of commutation frame period. **2.** In Pulse Code Modulation (PCM), any signal used to identify a frame of data.

FRAME SYNCHRONIZING PULSE -- A uniquely coded pulse or interval to mark start of commutation frame period.

FRAME SYNCHRONIZING PULSE SEPARATOR -- A circuit for separating frame synchronizing pulses or intervals from commutated signals.

FREE-RUNNING LOCAL SYNCHRONIZER OSCILLATOR -- A free-running oscillator circuit in the decommutator normally triggered by separated channel synchronizing pulses. It supplies substitute pulses for missing channel pulses.

FREQUENCY -- The number of complete cycles per second existing in any form of wave motion.

Band edge -- The extreme upper or lower frequency of a bounded continuous portion of a given frequency spectrum.

Natural, damped (accelerometer) -- Generally determined by the 90° phase shift method; i.e., by vibrating the instrument at a constant amplitude and observing the lowest frequency where there is a 90° phase shift between the accelerometer output and the applied vibration. This is monitored with a velocity coil or some other suitable reference signal.

Natural, damped (transducer) -- The frequency at which a system with a single degree of freedom will oscillate in the presence of damping upon momentary displacement from the rest position by a transient input.

Natural, undamped (transducer) -- The frequency of a sinusoidal excitation at which the motion of the mass element of a linear single-degree-of-freedom transducer lags behind the motion of the transducer case by a phase angle of 90°, regardless of the damping present.

FREQUENCY -- (continued)

Reference (speed control and flutter compensation) -- **1.** Sinusoidal speed-control signals recorded on the tape for the purpose of servo control of tape speed-during playback. **2.** Sinusoidal signals, recorded on tape which are used by the subcarrier discriminators to correct for the errors induced by flutter characteristics of tape speed during playback.

Resonant --

general -- The frequency at which the magnification factor is at a maximum. It normally occurs when the natural frequency of the item and the forcing (excitation) frequency are the same.

transducer -- The measurand frequency at which a transducer responds with maximum output amplitude (for subsidiary resonance peaks use "resonances."

Subcarrier center -- The assigned frequency of the unmodulated subcarrier.

FREQUENCY ALLOCATION -- 1. The process of designating portions of the frequency spectrum to accommodate new or proposed equipment and devices. **2.** That frequency band or specific frequency designated to be used in a certain manner as a result of the allocation process defined above. (See **RF allocation to equipment**.)

FREQUENCY ASSIGNMENT -- The authorization to operate in a frequency band or specific frequency channel; includes any associated conditions or limitations placed on a given station. Conditions placed on frequency assignments generally include RF power, type of emission, bandwidth, class of station, period of authorization, and geographical location.

FREQUENCY AUTHORIZATION -- The document or power which legalizes the assignment of a frequency or a frequency band.

FREQUENCY BAND -- A bounded continuous portion of a frequency spectrum. (Table of commonly used terms follows.)

COMMONLY USED TERMS RELATING TO FREQUENCY BANDS

Band	Frequency Range
VLF (Very Low Frequency)	3 kHz to 30 kHz
LF (Low Frequency)	30 kHz to 300 kHz
MF (Medium Frequency)	300 kHz to 3000 kHz
HF (High Frequency)	3000 kHz to 30 MHz
VHF (Very High Frequency)	30 MHz to 300 MHz
UHF (Ultra High Frequency)	300 MHz to 3000 MHz
SHF (Super High Frequency)	3000 MHz to 30 GHz
EHF (Extremely High Frequency)	30 GHz to 300 GHz
Hz (hertz) = cycles per second	
k (kilo) = 10^3	
M (mega) = 10^6	
G (giga) = 10^9	
T (tera) = 10^{12}	
VHF Communications Band	118 MHz to 174 MHz
UHF Communications Band	225 MHz to 400 MHz
Telemetry Band	1435-1535 MHz, 2220-2290 MHz
Command Control Band	406-549 MHz, 4400-4990 MHz

FREQUENCY BIAS -- A constant frequency purposely added to the frequency of a signal.

FREQUENCY CONTROL AND ANALYSIS (FCA) -- Identifies functions, facilities and services of frequency management as follows: assignment and coordination of frequency microseconds; interference elimination and prevention; frequency measurement, monitoring and surveying; and analysis of various transmitters and receivers.

FREQUENCY DEVIATION -- In frequency modulation, the peak difference between the instantaneous frequency of the modulated wave and the carrier frequency.

FREQUENCY DEVIATION LIMIT -- The upper and lower frequency limits beyond which a subcarrier should not be deviated.

FREQUENCY DIVISION MULTIPLEX (FDM) -- 1. A system for the transmission of information for two or more quantities (measurands) over a

common channel by dividing the frequency band. Amplitude, frequency or phase modulation of the subcarriers may be employed. **2.** A process or device in which the signal channel modulates a separate subcarrier, the subcarrier being spaced in frequency to avoid overlapping of the subcarrier sidebands.

FREQUENCY DOUBLING TRANSPONDER -- A transponder that doubles the frequency of the interrogating signal before retransmission.

FREQUENCY MANAGEMENT SYSTEM -- An assembly of resources and procedures to facilitate presentation and review of specific user requirements for use of the electromagnetic spectrum and by which the spectrum is controlled.

FREQUENCY-MODULATED OUTPUT -- An output which is obtained in the form of a deviation from a center frequency, where the deviation is proportional to the applied stimulus.

FREQUENCY OFFSET TRANSPONDER -- A transponder which changes the interrogating signal frequency by a fixed amount before retransmission.

FREQUENCY OUTPUT (transducer) -- An output, in the form of frequency, which is a function of the applied measurand, e.g., angular speed and flow rate.

FREQUENCY PLAN -- An organized and documented scheme which identifies the specific frequencies required for a military operation or to operate a telecommunications system.

FREQUENCY RESPONSE -- The portion of the frequency spectrum which can be sensed by a device within specified limits of amplitude error.

Maximum -- The frequency response calculated using a deviation ratio of 1.

Nominal -- The frequency response calculated using a deviation ratio of 5.

FREQUENCY RESPONSE CHARACTERISTIC -- Frequency variation of the transmission gain or loss for a device or system.

FREQUENCY-SHIFT KEYING (FSK) -- Modulation accomplished by switching from one discrete frequency to another.

FREQUENCY SPECTRUM -- (See **electromagnetic spectrum**.)

FREQUENCY SWING -- In frequency modulation, the peak difference between the maximum and minimum values of the instantaneous frequency.

FREQUENCY TOLERANCE -- The maximum permissible departure by the center frequency from the assigned frequency or, by the characteristic frequency from the reference frequency. The frequency tolerance is expressed in parts in 10^6 or in hertz.

FRICTION ERROR (transducer) -- The difference in resistance or output between readings obtained prior to and immediately after dithering an instrument while applying a constant stimulus; particularly applicable to potentiometric transducers.

FRICTION-FREE CALIBRATION (transducer) -- Calibration under conditions minimizing the effect of static friction often obtained by dithering.

FRONT (meteorology) -- Generally, the interface or transition zone between two air masses of different densities. Since the temperature distribution is the most important regulator of atmospheric density, a front usually separates air masses of different temperatures. Along with the basic density criterion and the common temperature criterion, many other features may distinguish a front, such as a pressure trough, a change in wind direction, a moisture discontinuity, and certain characteristic cloud and precipitation forms. The term "front" is used for: **a.** frontal zone, the three-dimensional zone or layer of large horizontal density gradient, bounded by frontal surfaces across which the horizontal density gradient is discontinuous (frontal surface refers specifically to the warmer side of the frontal zone); and **b.** surface front, the line of intersection of a frontal surface or frontal zone with the earth's surface or, less frequently, with a specified constant pressure surface.

FRONT FOCUS -- The distance from the front apex of a lens to the first focal plane. The first focal plane of a lens is the plane on which parallel rays incident to a lens' back surface come to a focus.

F-STOP -- Normally written "f-stop". (See **aperture, T-stop, stop**.)

FULL CLOSED (ballistic camera) -- Rest position of the capping shutter. blade when the shutter is closed to block an exposure regulated by another shutter.

FULL EXCURSION (transducer) -- A single movement away from the mean position in an oscillating or alternating motion over the entire range of the transducer.

FULL FRAME -- (See **frame, photography**.)

FULL OPEN (ballistic camera) -- Rest position of the capping shutter blade when the shutter is open to pass an exposure regulated by another shutter.

FULL-SCALE OUTPUT -- 1. The algebraic difference in electrical output between the maximum and minimum values of the measurand over which the instrument is calibrated. When the sensitivity slope is given by any other line than the end-point sensitivity, full scale expresses the algebraic difference, or the span of the instrument, as calculated from the slope of the straight line from which nonlinearity is determined. **2.** The algebraic difference between the end points.

FULL-SCALE SENSITIVITY -- (See **full-scale output**.)

FUNCTION TABLE --

Mathematics -- A table of the values for a mathematical function.

Computer -- A hardware device or a program which translates from one representation of information to another representation.

G

GAGE FACTOR -- (See **strain gage factor**.)

GAGE PRESSURE -- A differential pressure measurement in which the ambient pressure provides the reference. Also, a pressure in excess of the standard atmospheric pressure at sea level; 14.7 psi.

GAL (geodetic) -- An acceleration of 1 centimeter per second per second. Before the gal was adopted, the dyne, a unit of force, was used to express gravity. The real unit was dyne/gram; expressed symbolically by cm/s^2 . The term "gal" is not an abbreviation, it was invented to honor the memory of Galileo.

GAMMA (photography) -- A numerical expression of development contrast, which is the tangent of the straight-line part of the sensitometric curve with the log-e baseline.

GAP (computer) -- An interval on a magnetic tape which contains no information.

Inline -- The placement of two or more gaps so they fall on the same lateral axis of the tape.

Interlaced -- The displacement of two or more gaps in two or more heads along the longitudinal axis of the tape.

Staggered -- The displacement of two or more gaps along the longitudinal axis of the tape so that they do not fall on the same lateral axis of the tape.

GAP AZIMUTH ALIGNMENT -- The alignment of the line through the magnetic tape recorder head gaps relative to a line perpendicular to the precision-milled mounting pads in a plane parallel to the surface of the tape.

GAP SCATTER -- The distance which includes the trailing edges of the gaps for the magnetic tape record headstack and the centerlines of the gaps for the reproduce headstack.

GARBAGE -- Unwanted and/or meaningless data (sometimes called "hash").

GATE -- A circuit having an output and a multiplicity of inputs designed so the output is energized when, and only when, certain input conditions are met.

GATE SIGNAL -- That signal generated by some form of delay circuit required in connection with beam switching, automatic following, the application of automatic gain control (AGC) to a selected echo, and many other purposes.

GATE, TRACKING (radar) -- A timed, gate that develops range error signals from a video pulse according to whether the time of the center of the pulse is earlier or later than the time of the center of the gate. The tracking gate also prevents azimuth and elevation error signals from being. generated by video pulses whose time is different from the time of the gate. (See **notch gate**.)

GAUSSIAN DISTRIBUTION -- A theoretical frequency distribution that is bell shaped, symmetrical, and of infinite extent.

GENERAL CIRCULATION (meteorology) -- In the broadest sense, the complete statistical description of atmospheric motions over the earth. These statistics are generated from the ensemble of daily flow patterns and include not only the temporal and spatial mean conditions (zonal westerlies and easterlies, semipermanent waves, and meridional cells which are sometimes called the general circulation), but also the higher-order statistics which measure the spatial and temporal variability of the flow resulting from seasonal change and from the effects of transient cyclones and anticyclones.

GEODESIC -- The curve of shortest distance between two points on a surface. A geodesic on a surface may be defined as a curve in which the principal normal to the curve coincides with the normal to the surface at each of its points.

GEODESIC LINE -- The shortest line between any two points on any mathematically defined surface; also termed a "geodesic". A geodesic line on a spheroid of reference is sometimes called a "geodetic line". The term "geodetic", as applied to lines, is going out of use; "geodesic" is preferred.

GEODESY -- 1. The science which deals mathematically with the determination of the exact size and shape of the earth and the precise location of points on the Earth's surface. **2.** The term "geodesy" often refers to both the science which must depend upon determinations of the figure and size of the earth from direct measurements made on its surface (triangulation, leveling, astronomic and gravity determinations) and the art which uses the scientific determinations in a practical way. The latter is usually termed "geodetic surveying" or "geodetic engineering".

GEODETIC -- Signifies the basic relationship to an earth model in which the curvature of its sea-level surface is taken into account. In horizontal control surveys, the term "geodetic" is applied to operations and results based on the ellipsoid of revolution (spheroid). In spirit leveling, elevations are implied to be geoid. In determining elevations by vertical angles, elevations are related, in the ideal case where deflections of the vertical are available, to the ellipsoid of revolution. Since deflections of the vertical are not usually available in ordinary practice, the results are a mixture and are related to neither surface exactly.

GEODETIC LINE -- The shortest line between any two given points on the surface of the spheroid. Preferably called a "geodesic line", a geodetic line is a line of double curvature usually lying between the normal section lines which the two points determine. If the two terminal points are in nearly the same latitude, the geodetic line may cross one of the normal section lines. It should be noted that except along the Equator and along the meridians, the geodetic line is not a plane curve and cannot be sighted over directly. However, for conventional triangulation, the lengths and directions of geodetic lines differ inappreciably from a corresponding pair of normal section lines.

GEODIMETER -- An instrument which uses a modulated light beam for distance measurement.

GEOID -- The figure of the earth considered as a mean sea-level surface extended continuously through the continents. The actual geoid is an equipotential surface to which, at every point, the plumb line (direction in which gravity acts) is perpendicular. A geoid is obtained from observed deflections of the vertical and is the surface of reference for astronomical observations and for geodetic leveling. Theoretical geoids obtained with computed values of deflections of the vertical include the compensated geoid and the isostatic geoid.

Compensated -- A theoretical geoid derived from the actual geoid by the application of computed values of the deflection of the vertical which depend on the topography and isostatic compensation. The data upon which to base the effect of topography and isostatic compensation are obtained from readings of topographic maps; the effect is then computed in accordance with the assumption made with respect to isostasy, i.e., the depth and distribution of isostatic compensation. A method for accomplishing this was developed by Hayford, who accepted the Pratt theory of isostasy. If the theory and assumptions with respect to isostasy were exact and there were no anomalies, the compensated geoid would agree with the spheroid of reference.

isostatic -- An ideal geoid derived from the spheroid of reference by the application of computed values of the deflection of the vertical which depend upon the topography and isostatic compensation. The computed values of the deflection of the vertical used in obtaining the isostatic geoid are similar to those for the compensated geoid, but of opposite signs. If the theory and assumptions with regard to isostasy were exact and there were no anomalies, the isostatic geoid would agree with the actual geoid.

GEOID CONTOUR -- A line on the surface of the geoid of constant elevation related to the surface of the spheroid of reference. geoid contours represent differences in elevation between the geoid and the spheroid and depend on the

surface of reference. The same geoid referred to different surfaces of reference will give different sets of geoid contours.

GEOID HEIGHT -- The difference in elevation at a particular point between the geoid and spheroid of reference. The sign is plus when the geoid is above the spheroid.

GEOMETRICAL HORIZON -- The locus of points at which straight lines from the point of reference become tangential to the Earth's surface.

GEOMETRIC DILUTION OF PRECISION (GDOP) -- The increase in error of calculated space position which is caused by the location of the measured position relative to the tracking system. This is an increase which is caused solely by the geometry of the problem and assumes that all basic measurements maintain a constant accuracy.

GEOPHYSICS -- The science of the earth with respect to its structure, composition and development. Geophysics is a branch of experimental physics dealing with the earth, including its atmosphere and hydrosphere. It includes the sciences of dynamical geology and physical geography, and makes use of geodesy, geology, seismology, meteorology, oceanography, magnetism, and other earth sciences in collecting and interpreting earth data. Geophysical methods have been applied successfully to the identification of underground structures in the earth and to the search for structures of a particular type, for example: those associated with oil-bearing sands.

GEOPOTENTIAL HEIGHT -- The height of a given point in the atmosphere in units proportional to the potential energy of unit mass (geopotential) at this height, relative to sea level. The relation between the geopotential height Z and the geometric height z is:

$$Z=\frac{1}{980}\int_{o}^{z} g\,ds,$$

where g is the acceleration of gravity, so that the two heights are numerically interchangeable for most meteorological purposes. Also, a geopotential meter is equal to 0.98 dynamic meter.

GEOSYNCHRONOUS SATELLITE -- An earth satellite whose period of revolution is equal to the period of rotation of the earth about its axis.

GIGA -- A prefix denoting 10^9, abbreviated G.

GISEMENT -- The angle between the grid meridian and the geographic meridian. The term "gisement" is used in connection with the military grid, sometimes

called the "declination of grid north" and determined east and west from geographic north. Gisement is not used with the state coordinate systems where the corresponding angle on the transverse Mercator grid is the convergence of the local with the central geographic meridian, and is designated by delta-alpha. In the Lambert grid, the angle is known as the mapping angle, designated by the Greek letter theta (θ) and called the "theta angle".

GNOMONIC PROJECTION -- A type of map projection.

GONIOMETER -- A compact surveying instrument for observing horizontal angles and bearings and consisting of a vertical cylinder divided horizontally into two parts. The lower edge of the upper part is graduated in circular measure and revolves on the lower part, which carries a vernier on its upper edge. A magnetic needle is centered in the upper part, which is also provided with slits or a telescope for sighting purposes.

GRANULARITY -- 1. A characteristic of the output data of a measuring instrument. The measure of granularity is the smallest increment of the output data when it is in digital form. The smallest increment is also called "least count". (See **accuracy**.) **2.** The structure of a photographic emulsion as represented by the measured variation in the distribution of an apparently uniform silver deposit.

GRAPHING BOARD -- A board that holds graph paper on which information obtained from a pilot-balloon observation is plotted. The vertical scale of the board, engraved on a metal plate, is an altitude scale indicating the assumed height of the balloon at the end of each minute of flight. The horizontal scale is engraved on a movable T-square and is calibrated in units of direction and speed. The result is a curve of wind speed and direction against height.

GRATICULE (geodetic) -- A network of lines representing geographic parallels and meridians forming a map projection. (See **reticle**.)

GRAVIMETER (geodesy) -- A weighing device or instrument of sufficient sensitivity to register variations in the weight of a constant mass when the mass is moved from place to place on the earth and is thereby subjected to the influence of gravity at those places. A typical gravimeter consists of a spring which changes in length as gravity levels vary from place to place. Gravimeters are employed in determining differences in the intensity of gravity between an initial or base station at which the value of gravity is known or assumed, and at nearby points for which values of gravity are desired; also called "gravity meters".

GRAVITY, INTENSITY OF -- The force with which gravity acts, expressed in suitable units. Intensity of gravity may be expressed either as a force in "dynes" or as acceleration in "gals."

GRAVITY FORMULA, INTERNATIONAL -- A formula for theoretical gravity based on the assumptions that the spheroid of reference is an exact ellipsoid of revolution having the dimensions of the International Ellipsoid of Reference (Madrid, 1924), that it rotates about its minor axis once in a sidereal day, that the surface of the ellipsoid is a level surface, and that gravity at the Equator equals 978.049 gals. Omitting terms which are so small as to be negligible for practical purposes, the International Gravity Formula is as follows:

$$g=978.049\ (1 + 0.0052884 \sin^2 \varnothing - 0.0000059 \sin^2\ 2 \varnothing).$$

The International Gravity Formula was adopted by the International Association of Geodesy at the Stockholm meeting, 1930. The purpose was not primarily to represent the gravity observations then available, although g_e=978.049 gals was based on those observations, but to put the determination of the figure of the earth from gravity data on the same basis as the determination of its figure from deflections of the vertical. This formula is based on the Potsdam value for absolute gravity.

GRAVITY FORMULA, LONGITUDE TERM -- A suggested additional term for the formula for theoretical gravity derived from the longitude on a spheroid of reference having three unequal axes. With this additional term, the formula for theoretical gravity would be as follows:

$$g=_e\ [1 + \beta \sin^2 \varnothing - \beta_1 \sin 2\varnothing \pm c \cos^2 \varnothing \cos^2 (\lambda-\lambda 0)]$$

where g is the mean value of gravity at the Equator and c (like β and β_1) is a dimensionless number.

GRAY SCALE -- A strip of paper or film having a graduated series of tones from white to black.

GREAT CIRCLE -- The line of intersection of the surface of a sphere or any plane which passes through the center of the sphere. The shortest distance between any two points on a sphere is along the arc or a great circle connecting the two points. Great circles on the celestial sphere which are given particular designations are the equator, the ecliptic, meridians, hour circles, prime verticals, colures, and horizons. The shortest distance on an ellipsoid of revolution is a geodetic line (a geodesic), which is not a plane curve except for the equator (a

circle) and the meridians (ellipses). In cartography, the gnomonic is the only map projection on which a great circle is represented in all instances as a straight line.

GREAT CIRCLE LINE -- In land surveying, the line of intersection of the surface of the earth and the plane of a great circle of the celestial sphere. The term "great circle" is proposed for use in descriptions of methods for establishing parallels of latitude (standard parallels and correction lines) in surveys of the public lands of the United States. Since the earth is not a sphere, a great circle line is but an approximation of a great circle, and due to the deflection of the vertical will not, as surveyed, line in a single plane.

GROUND CHECK; BASELINE CHECK -- 1. A procedure followed before release of a radiosonde to obtain the temperature and humidity corrections for the radiosonde system. **2.** An instrument verification check carried out prior to the ground launch of an airborne experiment.

GROUNDCHECK CHAMBER -- A chamber used to check the sensing elements of heat and water vapor containing instruments for measuring temperature, humidity and pressure.

GROUND GATING -- Conversion of PAM signals at a telemetry ground station to 50 percent duty-cycle signals.

GROUND HAZARD AREA (safety) -- That portion of the land mass that is within the impact limit lines.

GROUND-REFLECTED MULTIPATH -- The essentially simultaneous reception of single-source radio signals over two discrete paths, one by a direct line of sight and the other by a reflection from the surface of the earth.

GROUND WAVE -- An electromagnetic wave radiated by an antenna that propagates along the Earth's surface or in the atmosphere close to the Earth's surface. (See **skywave**.)

GROUP VELOCITY, waveguide -- The velocity at which the energy spectrum is propagated parallel to the walls of the waveguide (numerically less than the velocity of light). In the phenomena of waveguide propagation, group velocity, is related to phase velocity by:

$$vgr = \frac{V^2}{V_p}$$

where V=velocity of wavefront propagation and is approximately equal to the velocity of light, and where V_p=phase velocity. When the guide size approaches and/or becomes free space, as in a horn antenna, the group velocity and the phase velocity both become equal to the velocity of the wavefront. (See **phase velocity and velocity of propagation**.)

GUARD BAND -- The frequency band between adjacent subcarrier channels when the subcarrier frequencies are deviated to the maximum permissible frequencies.

GUIDANCE SITE -- A specific location of high-order geodetic accuracy containing equipment and structures necessary to provide guidance services or a given launch rate. The guidance site may be an integrated part of a launch site, or it may be a remote facility. The guidance site will be assigned to the launch site or base complex.

GULP (computer) -- A small group of bytes; similar to a word or instruction.

GUN CAMERA -- A special aerial motion picture camera which automatically photographs any subject being fired upon for the purpose of scoring aerial gunnery. Widely used in aircraft instrumentation.

GUST -- 1. A sudden brief increase in the speed of the wind which is of a more transient character than a squall and followed by a lull or slackening in the wind speed. Generally, winds are least gusty over large water surfaces and most gusty over rough land and near high buildings. According to United States weather observing practice, gusts are reported when the top wind speed between the peaks and lulls is at least 9 knots. The duration of a gust is usually less than 20 seconds. **2.** With respect to aircraft turbulence resulting in increased structural stresses upon the aircraft, a sharp change in wind speed relative to the aircraft or a sudden increase in airspeed due to the fluctuations in the airflow.

GRADIENT DISTANCE -- The horizontal distance along an aircraft flight path from the edge of a gust to the point at which the gust reaches its maximum speed.

GUSTSONDE -- An instrument dropped from high altitude and carried by a stable parachute which is used to measure the vertical component of turbulence aloft; consists of an accelerometer and radio telemetering equipment.

GYRATOR -- A circuit element that does not conform to the principle of reciprocity. (See **nutator, spinner**.)

- **H**

HALATION -- A halo or ghost image surrounding the true image of a brightly lighted object on a photographic emulsion.

HANG FIRE (safety) -- A condition at launch when, after a delay, the igniter functions properly and propellant fires normally.

HARD COPY -- A printed copy of machine output in readable form, e.g., printed reports, listings, documents, summaries, etc.

HARDWARE -- Mechanical, magnetic, electrical and electronic devices or components.

HARMONIC -- An integral multiple of a fundamental frequency.

HARMONIC CONTENT (transducer) -- Distortion in a transducer sinusoidal output in the form of harmonics other than the fundamental component; usually expressed as a percentage of rms output.

HAZE -- An atmospheric condition which prevents or distorts visibility of objects at a distance.

HEAD STACK -- A group of two or more tape recorder heads mounted in a single unit for the purpose of obtaining multiple track recording or reproduction.

HEADWIND; OPPOSING WIND -- A wind which opposes the intended progress of an exposed moving object, e.g., rendering an airborne object's airspeed greater than its groundspeed. The opposite of a tailwind. This effect is particularly critical in air navigation (Note: a wind direction may have no component opposing the intended course of an aircraft, but because of drift effects may have a component opposing the aircraft's heading).

HEIGHT OF INSTRUMENT (geodetic) -- 1. In spirit leveling, the height of the line of sight of a leveling instrument above the adopted datum. **2.** In stadia surveying, the height of the center of the telescope (horizontal axis) of transit or telescopic alidade above the ground or station mark. **3.** In trigonometrical leveling, the height of the center of the theodolite (horizontal axis) above the ground or station mark.

HELIOGRAPH; HELIOTROPE -- An instrument composed of one or more plane mirrors, so mounted and arranged that a beam of sunlight may be reflected by it in any desired direction.

HELIX (antenna) -- An antenna with the elements consisting of spirals.

HETERODYNE -- To beat or mix two signals of different frequencies.

HEURISTIC -- An approach which encourages further experimentation and investigation. An intuitive trial-and-error method of attacking a problem, as opposed to the algorithmic method.

HEXADECIMAL NUMBER SYSTEM -- A number system using the equivalent of the decimal number 16 as a base.

HIGH (meteorology) -- An area of high pressure, with reference to a maximum of atmospheric pressure in two dimensions (closed isobars) in the synoptic surface chart, or a maximum of height (closed contours) in the constant-pressure chart. Since a high is always associated with anticyclonic circulation (on the synoptic chart), the term is used interchangeably with anticyclone.

HIGH FREQUENCY BIAS (magnetic tape recording) -- A sinusoidal signal which is mixed with the data signal during the direct record process on magnetic tape for the purpose of increasing the linearity and dynamic range of the recorded signal. The bias frequency is usually three to four times the highest information frequency which is to be recorded.

HIGH-SPEED PHOTOGRAPHY --,The photographing of fast-moving events in which the frame rate of the camera is increased to effectively slow down the event so information can be extracted. High-speed photography is sometimes broken down into the following categories: high speed -32-500 frames per second; very high speed -- 500-10,000 frames per second; ultra high speed -- above 10,000 frames per second.

HIGH VELOCITY NOISE (transducer) -- The noise in wire-wound potentiometric transducers which appears as a series of momentarily open circuits as the slider bounces along the coil when moved too quickly.

HIT-ON-THE-FLY PRINTER (computer) -- A printer whose print head is in continual motion.

HOLD (safety) -- A temporary delay in the countdown.

HOLD-FIRE (safety) -- Stopping the countdown to give more time for completion of a critical operation.

HOLLERITH -- A system of encoding information on punched cards. Any standardized method for encoding alphabetic, numeric or special characters on a machine card.

HORIZON, PHOTOGRAPHIC -- The horizon photographed simultaneously with a vertical photograph for the sole purpose of obtaining an indication of the tilt of the vertical camera at the instant of exposure.

HORIZONTALLY POLARIZED WAVE -- A linearly polarized wave whose electric field vector is horizontal with respect to the Earth's surface.

HORIZONTAL STRATIFICATION -- Constant meteorological conditions at a given altitude, over the area under consideration. The term "horizontally stratified atmosphere" is generally assumed to mean complete stratification at all latitudes. It follows that the vertical profile is constant over the area under consideration, although it need not be a standard profile. When large areas are considered, it is desirable to use the term "spherical stratification".

HORN -- A horn-shaped antenna. Usually designed as an extension of a waveguide whose sides flare from the original waveguide size to a larger aperture size; horn radiator.

HOUSEKEEPING (computer) -- Operations in a routine which do not contribute directly to the solution of the problem but do contribute directly to the operation of the computer.

HUNTING -- A continuous attempt to obtain a desired condition of equilibrium or balance in an automatic system, as in servomechanisms.

HURTER & DRIFFIELD CURVE -- (See **characteristic curve**.)

HYBRID TEE -- A tee prematched to design frequency.

HYDROMETEOR-- Any product of condensation or sublimation of atmospheric water vapor, whether formed in the free atmosphere or at the Earth's surface; also any water particles blown by the wind from the Earth's surface. Hydrometeors may be classified in a number of different ways: **a.** liquid or solid water particles formed and remaining suspended in the air (damp haze, clouds, fog, fog ice, and mist); **b.** Liquid precipitation (drizzle and rain); **c.** freezing precipitation (freezing drizzle and freezing rain); **d.** solid precipitation (ice pellets, snow grains and ice crystals); **e.** falling particles that evaporate before reaching the ground (virga); **f.** liquid or solid water particles lifted by the wind from the Earth's surface (drifting snow, blowing snow, blowing spray); and **g.** liquid or solid deposits on exposed objects (dew, hoarfrost, rime and glaze).

HYDROSTATIC EQUILIBRIUM -- The state of a fluid whose surfaces of constant pressure and constant mass or density coincide and are horizontal throughout. Complete balance exists between the force of gravity and the pressure force. The relation between the pressure and geometric height is given by the hydrostatic equation. The analysis of atmospheric stability has been developed to a high degree for an atmosphere in hydrostatic equilibrium.

HYGROMETER -- An instrument which measures the water vapor content of the atmosphere. There are six basically different means of transduction used in measuring this quantity and hence an equal number of types of hygrometers. These include: **a.** the psychrometer, which uses the thermodynamic method; **b.** the class of instruments which depends upon a change of physical dimensions due to the absorption of moisture; **c.** those which depend upon condensation of moisture; **d.** the class of instruments which depend upon a change in chemical or electrical properties due to the absorption of moisture; **e.** the class of instruments which depend upon the diffusion of water vapor through a porous membrane; and **f.** the class of instruments which depend upon the measurements of the absorption spectra of water vapor.

HYPERBOLIC ERROR -- The error in an interferometer system arising from the assumption that the directions of the wavefronts incident at two antennas of a baseline are parallel, whereby the equiphase path is a cone. Mathematically, the equiphase path is a hyperbola.

HYPERBOLIC SYSTEM -- A system where lines of position are determined from time or phase differences relative to two or more fixed stations which are the foci of hyperbolas. In a three-dimensional system, the lines of position become hyperbolic surfaces of position.

HYPERBOLIC DOVAP (HYPERDOP) -- A system using four or more DOVAP stations with a common reference signal which is not coherent with the interrogation signal. Hyperboloids of position are obtained by differencing the phase of one station against another. Space position is computed by intersection of three or more hyperboloids of position.

HYPERFOCAL DISTANCE -- 1. The distance between the lens and nearest object in focus when the lens is set for infinity. **2.** The ratio of the product of the effective focal length and the diameter of the exit pupil or effective diaphragm aperture of a lens or lens system to the diameter of the circle of confusion.

HYSTERESIS (transducer) The maximum difference in output, at any given measurand value within the specified range, when the value is approached first with increasing and then decreasing measurands. Hysteresis is expressed in percent of full-scale output.

HYPSOMETER -- Literally, an instrument for measuring height; specifically, an instrument for measuring atmospheric pressure by determining the boiling point of a liquid at a station. The relationship between the boiling point of a liquid and atmospheric pressure is given by the Clapeyron-Clausius equation. The sensitivity of the hypsometer increases with-decreasing pressure, making it more useful for high altitude work. Consequently, hypsometers are frequently used for height estimation.

I

IDENTIFICATION (computer) -- A code number or code name which uniquely identifies a record, block, file, or other unit of information.

IDLE TIME -- A period in which a computer is believed to be in good operating condition but is not in use.

IGNITION DELAY -- The time interval between the application of the firing pulse to the igniter squibs and the build-up of sufficient thrust to cause missile motion.

IGNITION FAILURE -- The condition existing when a puff of smoke is observed issuing from the nozzle of the missile motor but the propellant does not ignite and the launch is aborted.

ILLEGAL CHARACTER (computer) -- A character or combination of bits which is not accepted as a valid representation by the machine or by a specific routine.

IMAGE --

Photographic -- The representation of an object formed by optical or chemical means.

Computer -- An exact logical duplicate stored in a different medium.

IMAGE FREQUENCY -- A frequency removed from that of the local, oscillator by an amount equal to the intermediate frequency but in the opposite direction of the receiver local oscillator frequency.

IMAGE MOTION COMPENSATION -- A means of reducing the motion of an image at the film plane.

IMPACT AREA -- 1. The area surrounding an approved impact point. The extent and configuration of this area is based upon the missile dispersion characteristics. **2.** An area having designated boundaries within the limits of which all ordnance is to make contact with the ground.

IMPACT LIMIT LINE -- A line defining a limit beyond which a missile or any portion thereof will not be allowed to impact.

IMPACT PREDICTOR -- A device which can determine, in real time, the point on the Earth's surface where a ballistic missile will impact if thrust is instantaneously terminated.

IMPEDANCE -- The apparent resistance of a circuit to an alternating current; corresponds to the true resistance of a circuit to direct current.

INACCURACY -- The difference between the input quantity applied to a measuring instrument and the output quantity indicated by that instrument. The inaccuracy of an instrument is equal to the sum of its instrument error and its uncertainty.

INACTIVE FRONT -- A front, or portion thereof, which produces very little cloudiness and no precipitation (as opposed to an active front); a passive front.

INACTIVE LEG -- An electrical element within a transducer which does not change its electrical characteristics as a function of the applied stimulus. Specifically applies to elements which are employed to complete a Wheatstone bridge in certain transducers.

INCIDENT (safety) -- An impact which occurs outside the predetermined flight test area.

INCLINATION OF A SATELLITE -- The angle between the orbital plane and the Earth's equatorial plane (celestial Equator).

INCLUSIVE OR (computer logic) -- The Boolean operator which gives a truth value of true if either or both of the two variables it connects is true. If neither is true, the value is false.

INDEPENDENT SOURCE -- Data sources which have no components in common. Common primary power sources are excluded when reliability is judged to be very high.

INDEX COUNT -- An element number within a time frame.

INDEX MARKER -- A nonbinary periodic interpolating element within a time frame.

INDEX OF REFRACTION -- (See **refractive index, velocity of propagation**.)

INDEX REGISTER -- A register which contains a quantity to be used under direction of the control section of the computer hardware, e.g., address modification and counting.

INDEXING (computer) -- An address modification technique often implemented by means of an index register.

INDEXING, COORDINATE (computer) -- 1. A system of indexing individual documents by descriptors of equal rank so that a library can be searched for a combination of one or more descriptors. **2.** An indexing technique where the interrelations of terms are shown by coupling individual words.

INDIRECT ADDRESSING (computer) -- Any level of addressing other than the first level of direct addressing.

INDIVIDUAL GAP AZIMUTH -- In a magnetic tape record or reproduce head stack, the angle of an individual gap relative to a line perpendicular to the precision milled mounting pads in a plane parallel to the surface of the tape.

INERTIAL SYSTEM, PRIMARY -- A reference system of coordinates based on the so-called fixed stars.

INFINITE RESOLUTION -- The ability to provide a continuous output over the entire range of a device.

INFORMATION (computer) -- The meaning assigned to data by the known conventions used in its representation.

INFORMATION GATE -- A device which, when triggered, allows information pulses to pass.

INFRARED (IR) REGION -- The region of the electromagnetic spectrum between visible light and microwaves.

INHIBITOR GATE -- A device which, when triggered, prevents information pulses from passing.

INITIAL CONDITION -- The state of a dynamic system at some specified time. For all subsequent times, the equations of motion and boundary conditions determine the state of the system. The appropriate synoptic weather charts, for example, constitute a discrete set of initial conditions for a forecast. In many contexts, initial conditions are considered as boundary conditions in the dimension of time.

INITIALIZE -- To set certain counters, switches and addresses at specified times in a computer routine.

INLINE PROCESSING -- The processing of data in the order received without preliminary editing or sorting.

INPUT (computer) -- Information transferred from external sources or external storage into the internal storage of a computer or other device.

INPUT IMPEDANCE -- The impedance presented by the device to the source.

INPUT-OUTPUT (I/O) (computer) -- 1. A general term for the equipment used to communicate with a computer; commonly written: I/ϕ or I-ϕ. **2.** The data involved in such communication. **3.** The media carrying the data for input-output.

INPUT RECORDER -- Any device which makes a record of an input electrical signal.

INSTRUCTION (computer) -- A machine word or a set of characters in machine language which directs the computer to take certain action. More precisely, a set of characters which defines an operation together with one or more addresses (or no address) and which, as a unit, causes the computer to operate accordingly on the indicated quantities. Also denotes specialized instructions (commands and orders) which are interpreted in various types of input devices connected to the computer. The term "instruction" is preferred by many to the terms "command" and "order". Command is reserved for electronic signals; order is reserved for use in the meaning sequence (as in the order of characters).

INSTRUCTION CODE (computer) -- A system of symbols, names and definitions for all the instructions that are directly intelligible to a given computer or a given routine.

INSTRUMENT -- A device for observing a physical phenomenon to obtain information about the phenomenon. The output may be information for use by personnel or it may be signals for controlling a machine.

INSTRUMENTATION -- Used to denote instruments or a system of instruments, i.e., equipment.

INSTRUMENTATION TIMING -- Generally provides two functions, time cataloging and increment timing. Time cataloging uniquely identifies particular instants in time using code words. Incremental timing provides uniformly spaced indications (1000 pps marks) from which fine divisions of time may be read and added to the code word.

INSTRUMENTED RADAR ACQUISITION (IRACQ) -- An operation in which modification of a radar enables more effective acquisition and tracking within its range of responsibility.

INSULATION RESISTANCE -- An electrical measure of the insulation, at a specified voltage, between given components. Usually expressed in ohms.

Transducer -- The resistance measured between specified insulated portions of a transducer when a specified dc voltage is applied.

INTEGRATED TRAJECTORY SYSTEM (ITS) -- A multiple target tracking system composed of several Angle Measuring Equipment (AME) and Distance Measuring Equipment (DME) sites whereby selection of station combinations can be made during flight to provide the optimum geometrical solution to space position at any given time of missile flight.

INTEGRATING ACCELEROMETER (transducer) -- A transducer designed to measure velocity and/or distance by means of time integration of acceleration.

INTERFERENCE -- 1. Any radiation which disrupts the design function of any device which uses electromagnetic energy. **2.** (frequency management) The term "harmful interference" is used to denote any radiation which endangers the functioning of a radio navigation or other safety service, or seriously degrades a radio communications service. Additionally, the term "harmful interference" is used to denote the type of interference which actually causes an outage on a frequency as opposed to interference which is purely a source of annoyance.

INTERFERENCE GUARD BANDS -- The frequency bands on each side of the authorized frequency band which minimize interference between radio channels.

INTERFEROMETER SYSTEM -- An electronic system comparing the phase of an RF signal received at two antennas. This phase difference is then representative of the direction cosine of arrival of the RF wavefront.

INTERMEDIATE-FREQUENCY (IF) BAND SHIFT FACTOR -- A factor by which the design IF bandwidth in PAM telemetry is multiplied to produce a receiver IF bandwidth that is sufficiently wide to allow for Doppler shifts and receiver and transmitter drifts.

INTERMEDIATE-FREQUENCY BANDWIDTH -- For telemetry receivers, the post-conversion bandwidth.

INTERMODULATION -- Modulation of the components of a complex wave by each other, producing new waves whose frequencies are equal to the sums and differences of integral multiples of the component frequencies of the original complex wave.

INTERNAL STORAGE -- Instructions stored within the computer which can be executed directly.

INTERROGATOR -- Equipment that produces and emits a pulsed or continuous wave signal
to initiate a reply signal from a transponder.

INTERROGATION SIGNAL -- A pulsed or continuous wave signal emitted to initiate a
reply signal from a transponder or responder.

INTERRUPT (computer) -- A break in the normal flow of a system or routine such that the flow can be resumed from that point at a later time. An interrupt is usually caused by a signal from an external source.

INTERVAL CALIBRATION -- (See **step calibration**.)

INTRUSION -- The intentional insertion of electromagnetic energy into transmission paths to deceive operators or cause confusion.

INVAR -- An alloy of nickel and iron having a very low coefficient of thermal expansion. Invar was discovered by C. E. Guillame of the International Bureau of Weights and Measures, Paris. Because Invar has a low coefficient of thermal expansion (about 1/25 that of steel), it has replaced steel in the construction of tapes for measuring geodetic base lines, and is used in other places where a metal of that characteristic is desired. Invar also is used in the construction of some leveling rods, first-order leveling instruments and in the construction of pendulums.

INVERSE POSITION COMPUTATION -- The derivation of the length and the forward and back azimuths of a geodetic line by computation based on the known geodetic positions of the ends of the line. This is called inverse because it reverses the usual order of computation.

INVERSION (meteorology) -- A temperature increase which occurs at a point or through a layer as altitude increases. Opposite of the condition where temperature decreases as height increases (normally occurs in the atmosphere).

ION CLOUD -- An inhomogeneity or patch of unusually great ion density in one of the regular regions of the ionosphere. Such patches occur quite often in the E-region and are called "sporadic E-layers".

IONOSPHERE -- The atmospheric shell characterized by a high ion density. Its base is at about 70 or 80 km and it extends to an indefinite height.

ISOBAR -- A line of equal or constant pressure; an isopleth of pressure. In meteorology, it most often refers to a line drawn through all points of equal atmospheric pressure along a given reference surface such as a constant-height surface (notably mean sea level on the surface charts), an isentropic surface, the vertical plane of a synoptic cross section, etc. The pattern of isobars has always been a main feature of surface-chart analysis. It was once standard procedure to draw isobars at 3-millibar intervals; however, the advent of constant-pressure charts for upper-air analysis has brought about the use of 4-millibar intervals to simplify the conversion from surface isobars to 1000-millibar contour lines.

ISOGON -- A line on some given surface joining all points having the same direction of a particular vector quantity. In meteorology, isogons-are usually drawn for the velocity vector as an aid in constructing streamlines for a wind field.

ISOPERIMETRIC CURVE -- A line on a map projection along which there is no variation from exact scale. There are two isoperimetric curves passing through every point on an equal-area map projection. Due to this characteristic, the isoperimetric curve is preferred for engineering maps.

ISOPLETH -- 1. In common meteorological usage, a line of equal or constant value for a given quantity with respect to either space or time; same as isogram. **2.** More specifically, a line drawn through points on a graph which have the same numerical value or which occur with the same frequency as a function of the two coordinate variables. **3.** A straight line along which lie corresponding values of a dependent and independent variable; also called "isarithm."

ISOSTASY -- A condition of approximate pressure equilibrium in the earth's crust such that the gravitational effect of masses extending above the surface of the geoid in continental areas is approximately counterbalanced by a deficiency of density in the material beneath those masses, while the effect of deficiency of density in ocean waters is counterbalanced by an excess of density on the material under the oceans. The basic principle of isostasy is that the masses of prismatic columns of the outer part of the earth extending to some constant depth below the surface of the geoid are proportional to the areas of their sea-level sections, regardless of their surface elevations. The depth below sea level to which these hypothetical columns extend is known as the depth of isostatic compensation, and is somewhere between 60 and 70 statute miles. While isostasy is generally accepted as a proven principle, there are several theories as to the relative distribution of the matter producing this condition of equilibrium; the two main ones being those of Airy and Pratt.

ISOSTATIC COMPENSATION -- The departure from normal density of material in the lower part of a column of the Earth's crust which balances or compensates

for land masses above sea level and deficiency of mass in ocean waters, and produces the condition of approximate equilibrium of the Earth's crust known as isostasy.

ISOSTATIC COMPENSATION, DEPTH OF -- The depth below sea level at which the conditions of equilibrium, known as isostasy, are complete. Investigations of geodetic and gravimetric data in the United States determine the depth of isostatic compensations to be between 60 and 70 statute miles.

ISOTACH -- A line on a given surface which connects points of equal wind speed; isovel; isokinetic.

ITERATE (computer) -- To repeatedly execute a series of instructions until a particular condition is satisfied, e.g., a loop in a routine.

IVORY POINT -- A small pointer extending downward from the top of the cistern of a Fortin barometer. The level of the mercury in the cistern is adjusted so that it just comes in contact with the end of the pointer, thus setting the zero of the barometer scale.

J

JERK -- The time rate of change of acceleration. Expressed in ft/s^3, cm/s^3 or g^1s/s.

JET STREAM -- Relatively strong winds concentrated within a narrow stream in the atmosphere. While this term may be applied to any such stream regardless of direction, including vertical, it generally refers to a quasi-horizontal jet stream of maximum winds embedded in the mid-latitude westerlies and concentrated in the high troposphere. The question of the maintenance of the jet stream is a cardinal problem of theoretical meteorology. Two such jet streams are sometimes distinguished. The predominant one, the polar-front jet stream, is associated with the polar front of middle and upper-middle latitudes. Very loosely, it may be said to extend around the hemisphere. But, like the polar front, it is discontinuous and varies greatly from day-to-day. A subtropical jet stream is found, at some longitudes, between 20° and 30° latitude, and is strongest off the Asian coast. In the analysis of upper-level charts, a jet stream is indicated whenever it is reliably determined that the wind speed equals or exceeds 50 knots.

JUMP INSTRUCTION -- (See **transfer**.)

JUSTIFICATION (computer) -- The act of adjusting, arranging or shifting digits, left or right, to fit a prescribed pattern.

K

KELVIN TEMPERATURE SCALE (°K); ABSOLUTE TEMPERATURE SCALE, THERMODYNAMIC TEMPERATURE SCALE -- An absolute temperature scale independent of the thermometric properties of the working substance. On this scale, the difference between two temperatures T_1, and T_2 is proportional to the heat converted into mechanical work by a Carnot engine operating between the isotherms and adiabats through T_1, and T_2. A gas thermometer using a perfect gas has the same temperature scale. For convenience, the Kelvin degree is considered identical to the Centigrade degree., The ice point is 273.16°K.

KEYER --

Telemetry -- A Pulse Amplitude Modulation-to-Pulse Doppler Modulation (PAM-to-PDM) converter.

Radar -- A switching device used to supply the current which drives the magnetron.

L

LAG -- A measure of the delay between two events.

LAG INTERVAL (ballistic camera) -- Time interval between successive capping shutter operations.

LANDFORM -- The shapes into which the Earth's surface is sculptured by natural forces. The term "landform" is used extensively in place of and with the meaning of the more restricted term "physiographic form".

LANDING ROCKET -- A manned space vehicle operated to transfer passengers and cargo from a satellite or larger orbiting spacecraft to the surface of a planet. A landing rocket must be able to reduce its velocity to safely enter into a planet's atmosphere and touchdown on the surface.

LAPLACE EQUATION (geodetic) -- The equation which expresses the relationship between astronomic and geodetic azimuths in terms of astronomic and geodetic longitudes and geodetic latitude. The common form is:

$$\alpha A - \alpha G = -(\lambda A - \lambda G) \sin \varnothing G$$

in which αA and λA are astronomic azimuth and longitude; αG, λG, and $\varnothing G$ are geodetic azimuth, longitude, and latitude, respectively. The signs depend upon convention. As written above, north latitudes and west longitudes are considered positive.

LAPLACE STATION (geodetic) -- A triangulation or traverse station at which a Laplace azimuth is determined. At a Laplace station, both astronomic longitude and astronomic azimuth are determined.

LAPSE RATE -- The decrease of an atmospheric variable with height (the variable being temperature unless otherwise specified). The term applies ambiguously to the environmental lapse-rate and the process lapse-rate. The meaning must often be ascertained from the context.

LASER -- (See **light amplification by stimulated emission of radiation**.)

LATENT IMAGE -- An exposed but undeveloped photographic image.

LATERAL PARITY -- A quality control method, usually internal to, the tape unit, which automatically checks the sum of the one-bits recorded in each frame. A lateral parity check implies a method of checking across the width of a magnetic tape. (See **longitudinal parity**.)

LATITUDE --

Astronomic -- The angle between the plumb line and the plane of the celestial equator; also defined as the angle between the plane of the horizon and the axis of rotation of the earth. Astronomic latitude is the latitude which results directly from observation on celestial bodies, uncorrected for deflection of the vertical (station error), which may amount to as much as 25" in the United States. Astronomic latitude applies only to positions on the earth, and is reckoned from the astronomic Equator (0°), north and south through 90°.

Geocentric -- The angle at the center of the earth between, the plane of the celestial Equator and a line to a point on the surface of the earth. Geocentric latitude is used as an auxiliary latitude in some computations in astronomy, geodesy and cartography in which connection it is defined as the angle formed with the major axis of the ellipse (meridional section of the spheroid) by the radius vector from the center of the ellipse to the given point. In astronomic work, geocentric latitude is also called "reduced latitude", a term that is sometimes applied to parametric latitude in geodesy and cartography. The geocentric and isometric latitudes are approximately equal.

Geodetic -- The angle which the normal to the spheroid at the given point makes with the plane of the geodetic equator. Geodetic latitudes are counted from the Equator, but in the horizontal control survey of the United States they are computed from the latitude of station Meades Ranch as prescribed in the North American Datum of 1927. In recording a geodetic position, it is essential that the geodetic datum on which it is based also be stated. A geodetic latitude differs from the astronomic latitude by the amount of the meridional component of the local deflection of the vertical (station error) which in this country may amount to more than 25".

On a sphere -- The angle at the center of the sphere between the plane of the Equator and the line to the point of the surface of the sphere. Some problems of geodesy and cartography are greatly simplified by the use of latitudes on a sphere which have some definite relationship (as equal area or equal volume) to the spheroid.

LATITUDE -- (continued)

Parametric -- Geometric or reduced latitude; the angle at the center of a sphere which is tangent to the spheroid along the geodetic Equator, between the plane of the Equator and the radius to the point intersected on the sphere by a straight line perpendicular to the plane of the equator and passing through the point on the spheroid whose parametric latitude is defined. Parametric latitude is an auxiliary latitude used in problems of geodesy and cartography. In astronomical work, when the term "reduced latitude" is used, "geocentric latitude" is meant.

Plane surveying -- The perpendicular distance in a horizontal plane of a point from an east-west axis of reference. The difference of latitude of the two ends of a line is frequently called the "latitude of the line" and defined as the orthographic projection of the line on a reference meridian. The latitude of the middle of the line is also referred to as the "latitude of the line".

Rectifying -- The latitude on a sphere such that a great circle on it has the same length as a meridian on the spheroid, and such that all lengths along a meridian from the Equator are exactly equal to the corresponding lengths on the spheroid. An auxiliary latitude used in problems of geodesy and cartography.

Variation of -- A small periodic change in the astronomic latitude of points on the earth due to variation of the pole.

Photographic -- The amount by which a photographic emulsion may be over or underexposed without appreciable loss in image quality.

LAUNCH AREA (safety) -- The area designated for missile launches.

Land -- The area in the vicinity of the launch complex in which significant danger to personnel would exist in the event of a malfunction of the missile during preparation for launch and during the initial flight phase.

Sea -- The water area within 5 nautical miles of the center of the pad used for a missile launch.

LAUNCH SITE -- A grouping of one or more launch and service facilities and one launch control center.

LEAKAGE RATE (transducer) -- The rate at which a specified fluid applied to the sensing element at a specified pressure is permitted to leak from the sensing element.

LEAP FROGGING -- The process of phasing or delaying the ranging pulse of

a tracking radar to move or shift the tracking gate and target blip on the scope presentation past the target blip from another radar.

LEASED LINE NETWORK -- A network usually reserved for the exclusive use of one customer.

LEAST AVERAGE DEVIATION -- A method of calculating the best-fit straight line for which the average residuals are minimized.

LEAST COUNT -- (See **resolution**.)

LEAST SQUARES -- A mathematical method of determining the most probable values of a series of quantities from a set of observations greater in number than are necessary to determine those quantities. The method rests upon the mathematical demonstration that where each of a very large number of observations of any quantity is of the same quality as the others, the most probable value of the quantity is the one for which the sum of the squares of the residual errors (or corrections) is a minimum. If the observations are of unequal weight, the most probable value is the one for which the sum of the squares of the weighted residuals is a minimum. In data reduction, this is a method used as a means of obtaining the most probable values of position and associated data and, at the same time, fully coordinating and correlating those data. Least squares have also been designated as "minimum squares".

LEAST SQUARE LINEARITY -- A manner of expressing nonlinearity as a deviation from a straight line for which the sum of the squares is minimized.

LEFT-HAND (counterclockwise) POLARIZED WAVE -- An elliptically polarized electromagnetic wave in which the rotation of the electric field vector is counterclockwise for an observer looking in the direction of propagation. (See **polarization sense**.)

LEGENDRE'S THEOREM (geodetic) -- 1. The angles A, B and C of a spherical triangle whose sides are a, b and c (supposedly very small with respect to the radius of the sphere) are equal to the corresponding angles of a plane triangle whose sides are the same length increased by one-third the spherical excess of the triangle. **2.** In two triangles, one a spherical triangle whose sides a, b and c (very small in comparison to the radius of the sphere) and the second a plane triangle with sides of the same length, the angles A, B and C of the spherical triangle are greater than the corresponding angles of the plane triangle by one-third of the spherical excess of the spherical triangle. The use of Legendre's Theorem greatly simplifies the treatment of spherical triangles by permitting their solution as plane triangles.

LENS -- Any device whereby controlled focusing of visible electromagnetic radiation may be accomplished.

LENS SAG or BENDING -- An angular displacement of an optical axis due to the effect of gravitational or inertial forces on an optical system; usually refers to telescope tube flexure.

LENS SPEED -- A measure of the efficiency of a lens for gathering light, often by f-stop, T-stop or relative aperture.

LEVEL --

Spirit -- A closed glass tube (vial) with a centerline which forms a circular arc and an interior surface ground to precise form. The spirit level is nearly filled with ether or another liquid of low viscosity leaving enough free space for the formation of a bubble. This type of level is used on surveying and astronomical instruments which make use of the horizon, or zenith, as a reference of observations and those which require more than an approximate adjustment to such reference. When in adjustment, a tangent to the center of the bubble defines a horizontal line in the plane of the longitudinal axis of the tube with an accuracy and precision which depend upon the quality of the workmanship and sensitivity of the level. The sensitivity (sometimes called "sensibility") of a spirit level depends upon the radius of the curvature of its longitudinal section; the longer the radius, the more sensitive the level. The sensitivity is rated by equating the linear length between graduation marks on the tube to its angular value at the center of the curvature of the tube.

Striding -- A spirit level which is mounted so it can be placed above and parallel with the horizontal axis of a surveying or astronomical instrument and supported so it can be used to measure the inclination of the horizontal axis to the plane of the horizon. Generally, a striding level is of greater than average sensitivity and is mounted directly upon the pivots on which the instrument rotates. Such a device is used to make the inclination of the horizontal axis quite small to permit measuring the magnitude of any remaining inclination.

LEVELING --

First order -- Spirit leveling divided into sections of 1 to 2 kilometers in length with each section leveled in both forward and backward directions; the results of the two levelings not to differ by more than 4.0 millimeters times the square root of the length of the section in kilometers (4.0 mm x $\sqrt{K}$).

LEVELING (continued)

Geodetic -- Spirit leveling of a high order of accuracy. Usually extended over large areas to furnish accurate control in the vertical dimension for all surveying and mapping operations; follows the geoid and its associated level surfaces, which are irregular, rather than a mathematically defined spheroid or ellipsoid and associated regular surfaces.

Second order -- Spirit leveling which does not attain the quality of first order leveling. It conforms to the following criteria: uses first order instruments and methods; requires both forward and backward leveling or loop closures; differences of forward and backward leveling or loop closures does not exceed 8.4 millimeters times the square root of the length in kilometers (8.4 mm x $\sqrt{K}$). Second order leveling is further divided into two classes. In remote areas where a second-order line is longer than 25 miles, the line will be double run; this is termed "second-order class I leveling." The other, second-order class II leveling, includes single-run area leveling of less than 25 miles, single-run loops, and double-run spur lines.

Spirit -- The determination of elevations of points with respect to a common datum by means of an instrument using a spirit level to establish a horizontal line of sight. A spirit level is attached to a telescope so that the the axis of the level and the line of collimation is parallel and the level adjusted so that the axis is horizontal. The difference in readings on vertical rods at two different points is the difference in elevation of the points. If the elevation of one point is known, the other also becomes known. By a series of progressive level lines, each including the observed value at a single station, the elevations of a series of points (bench marks) are determined.

Third order -- Leveling which does not attain the quality of second-order leveling but conforms to the following criteria: lines not extending 30 miles and closing upon lines of equal or higher-order accuracy and closing errors not exceeding 12 millimeters times the square root of the length of the line in kilometers (12 mm x $\sqrt{K}$).

Trigonometric -- The determination of differences of elevations by means of observed vertical angles combined with length of lines.

LEVEL SURFACE (geodetic) -- A surface which is perpendicular to the plumb line, i.e., the direction in which gravity acts. The surface of a body of still water is a level surface. Level surfaces are approximately spheroidal. In a survey of limited area, a level surface is sometimes treated as a plane surface.

LIBRARY (computer) -- A collection of standard, checked out, computer routines.

LIBRARY ROUTINE (computer) -- A checked out routine which may be incorporated into a larger routine and is maintained in a library as an aid to programmers.

LIFE (transducer) --

Operating -- The minimum length of time over which the specified continuous and intermittent rating of a transducer applies without change in transducer performance beyond specified tolerances.

Storage -- The minimum length of time over which a transducer can be exposed to specified environmental storage conditions without changing its performance beyond specified tolerances.

LIFE CYCLE -- The minimum number of full range excursions or specified partial range excursions over which a transducer will operate without changing its performance beyond specified tolerances.

LIGHT AMPLIFICATION BY STIMULATED EMISSION OF RADIATION (LASER) -- A device for the amplification or generation of coherent light signals.

LIGHT FOG (photography) -- Density produced by exposure of light-sensitive materials to extraneous light.

LIMITER -- A circuit whose output is constant for all inputs above a predetermined value.

LIMITING ANGLE -- In electronic winds-aloft measurements, the elevation angle below which errors in tracking caused by reflection and refraction are so great they make the resulting wind computations unreliable.

LIMIT OF THE ATMOSPHERE -- The level at which the density of the atmosphere becomes the same as the density of interplanetary space (usually about one particle per cubic centimeter). Also, the altitude where a molecule of air ceases to be held in paths which are segments of earth orbits.

LINEARITY -- A relationship existing between two quantities such that the change in one quantity is exactly and directly proportional to the change in the other quantity.

End point -- Linearity related to a straight line between the end points.

LINEARITY (continued)

Independent -- Linearity related to the best fit straight line.

Least squares -- Linearity related to a straight line for which the sum of the squares of the residuals is minimized.

Terminal -- A special form of theoretical slope linearity for which the theoretical end points are 0 and 100 percent of both the output and the measurand.

Theoretical slope -- Linearity related to a straight line between the theoretic end points.

LINEARLY POLARIZED WAVE -- An electromagnetic wave whose electric field vector lies at all times along a fixed line at a point in a homogeneous isotropic medium.

LINEAR PROGRAMMING -- A technique used in mathematics and operations research to find a best solution for a certain type of problem where the inequalities and the functions to be maximized must be linear forms, e.g., to determine the ratio of quantities to blend, select, etc., for an optimum mixture. Sometimes called "optimum programming" and "mathematical programming."

LINE OF LEVELS (geodetic) -- A continuous series of measured differences of elevation. The individual differences may be single observations in the case of single-run leveling or the means of repeated observations in the case of double-run leveling.

Spur -- A line of levels run as a branch from the basic line.

LINE-OF-SIGHT PROPAGATION -- Propagation within the radio horizon.

LINE PRINTER -- A printer in which the entire line of characters is composed and determined within the device prior to printing.

LINKAGE (computer) -- A technique for providing interconnections between a main routine and a closed routine, i.e., entry and exit for a closed routine from the main routine.

LIST (computer) -- To print every relevant item of data.

LOAD -- To transfer information into the internal storage of a computer from auxiliary or external storage.

LOAD AND GO -- A computer operation and compiling technique in which the pseudo language is directly converted to machine language and the program run without an output machine program being created.

LOAD IMPEDANCE (transducer) -- The impedance presented to the output terminals of an electrical or electronic device.

LOADING ERROR (transducer) -- The error introduced when more than negligible current is drawn from the output of a device. In potentiometric transducers, the loading error varies with the position of the slider and the current drawn.

LOADING NOISE (transducer) -- A noise which occurs in potentiometric transducers when current is drawn from the instrument. It is caused by fluctuating contact resistance between the slip ring and the slip contact.

LOAD ISOLATOR -- A waveguide or coaxial device which provides a good energy path from a signal source to a load, but provides a poor energy path for reflections from a mismatched load back to the signal source.

LOAD POINT (magnetic tape) -- The physical beginning of recording as determined by a reflective spot attached to the tape at that point.

LOCATION (computer) -- A storage position in the main internal storage designated by a unique address.

LOCK ON -- 1. A term used when a radar has acquired an automatic mode of track on a target. **2.** A term which signifies that a tracking system is continuously tracking a target.

LOCK OUT -- A method of preventing the explosion of a warhead or ignition of a later stage of a multiple stage vehicle.

LOCK UP -- A method which prevents the separation of a multistage vehicle.

LOGGER -- A device which automatically records physical processes with respect to time.

LOGIC (computer) -- The basic principles and applications of truth tables, gating, interconnections, etc., required for arithmetical computation in a computer.

LOGICAL DESIGN -- 1. The logic of the system, machine or network. **2.** The planning of a computer system prior to its engineering design.

LOGICAL DIAGRAM -- A representation of logical elements and their interconnections.

LOGICAL OPERATIONS (computer) -- The operation of comparing, selecting, making references, matching, sorting, merging, etc., where 1 and 0 correspond to yes and no and constitute the elements being operated on.

LOGICAL PRODUCT -- A Boolean expression denoting the intersection of two classes or propositions; i.e., a • b implies a and b. In computers, a logical product is the resultant of an AND operation on two arguments.

LOGICAL SUM -- A Boolean expression denoting the union of two classes or propositions; i.e., a + b implies a or b, or both. In computers, a logical sum is the resultant of an inclusive OR operation on two arguments.

LONG-BASELINE SYSTEM -- A trajectory measuring system with receiving stations separated by an order of magnitude of the distance to the target being tracked.

LONGITUDE -- A coordinate distance, linear or angular, from a north-south reference line.

Astronomic -- The angle between the plane of the celestial meridian and the plane of an initial meridian arbitrarily chosen. Astronomic longitude is the longitude which results directly from observations on celestial bodies, uncorrected for deflections of the vertical; the prime vertical component which, in the United States, may amount to more than 18". Astronomic longitude is measured by the angle at the celestial pole between tangents to the local and initial meridians, or by the arc intercepted on the Equator by those meridians. The following are among the various methods used in determining astronomic longitude:

celestial signals -- The local time at the new station of the occurrence of celestial phenomena is compared with the corresponding eclipses of the Moon, eclipses of Jupiter's satellites, occultations of stars, etc.

chronometric -- The local time at the new station is compared with the time at the base station by transporting chronometers from one station to the other.
lunar distance, Moon-altitude, Moon-time at a base station, etc. -- The local time at the new station is compared with the time at the base station; both times are determined from the position of the Moon relative to other celestial bodies.

LONGITUDE -- (continued)

Astronomic -- (continued)

telegraphic -- The local time at the new station is compared with the time at the base station by means of telegraph landlines and sea cables.

terrestrial signals -- Local times noted at new and base stations of the occurrence of such signals as a flashing light.

wireless -- local time at the new station is compared with the time at a base station by means of radio. This is the generally used and preferred method.

Celestial -- The arc of the ecliptic intercepted between the vernal equinox and the foot of a great circle perpendicular to the ecliptic and passing through the object whose longitude is to be defined. Celestial longitude is measured along the ecliptic from west to east. It is not the same as astronomic longitude and does not produce the usual problems of surveying.

Geodetic -- The angle between the plane of the geodetic meridian and the plane of an initial meridian, arbitrarily chosen. A geodetic longitude may be measured by the angle at the pole of revolution of the spheroid between the local initial meridians, or by the arc of the geodetic Equator intercepted by those meridians. In the United States, geodetic longitudes are numbered from the Meridian of Greenwich, but are computed from the meridian of station Meades Ranch. In recording geodetic position, it is essential that the geodetic datum on which it is based also be stated. A geodetic longitude differs from the corresponding astronomic longitude by the amount of the prime vertical component of the local deflection of the vertical divided by the cosine of the latitude. This may amount to as much as 26" in the United States.

LONGITUDINAL PARITY (computer) -- A quality control method (usually internal to the tape unit) which automatically checks the sum of the bits, modulo 2, recorded in each tape channel of a record relative to an odd or even condition. If the sum is even, a "0" bit is stored at the end of the record in the corresponding channel. If the total is odd, a "1" bit is stored. Thus, the total of the bits in a channel is always even. (See **lateral parity**.)

LOOK ANGLE -- 1. The field of view, expressed in angular units, of a sensor or antenna within which a target may be detected. **2.** The azimuth and elevation of the line of sight to a target from an observer. **3.** The angle between the missile's longitudinal axis and the line-of-sight vector from a specified point on the missile to a specified point on the target.

LOOK ANGLE INDICATOR -- A device which provides continuous look angle data when the missile is within a predetermined distance from a specified point on the target.

LOOP (computer) -- A coding technique in which a group of instructions are repeated, usually with modified instructions, modified data values or modified addresses.

LOOP RANGE -- The total distance from a transmitter to a target and to a receiver. A spherical surface is obtained if the transmitter and receiver are at the same site for a specific loop range. An elliptical surface is obtained if separation is maintained between transmitter and receiver for a specific loop range.

LONG RANGE ACCURACY (LORAC) -- A two-dimensional navigation system using continuous wave transmission to provide hyperbolic lines of position through RF phase comparison techniques from four transmitters. The system is used for surveying or ship-positioning.

LONG RANGE NAVIGATION (LORAN) -- A two-dimensional pulse-synchronized navigation system which determines hyperbolic lines of position through pulse-time differencing from a master station compared to two slave stations. LORAN-C (CYTAG) phase compares the continuous wave in the pulse envelopes for greater accuracy implementing pulse techniques for resolving ambiguities. The position of a LORAN receiver on a particular hyperbola may be determined by measuring the difference in arrival times of pulses sent in a synchronous manner from a single pair of LORAN transmitters. The position on another hyperbola may be determined by a similar time measurement from another pair of transmitters. Intersection of the hyperbolas fixes the receiving point. LORAN positions may be obtained at the range of 750 nautical miles in daylight and 1400 nautical miles at night and are very nearly independent of weather conditions. The precision of a LORAN position is comparable to that obtained by high-grade celestial observations with a sextant.

LO-REFERENCE SIGNAL (meteorology) -- The audio-frequency signal transmitted by a radiosonde when the baroswitch pen passes each fifth contact of the commutator up to a number determined by the design of the commutator. It then signals every contact except the fifth, which is transmitted as a hi-reference signal.

LOW; DEPRESSION (meteorology) -- An area of low pressure referring to a minimum of atmospheric pressure in two dimensions (closed isobars) on a constant-height chart or a minimum of height (closed contours) on a constant-

pressure chart. Since a low on a synoptic chart is always associated with cyclonic circulation, the term is used interchangeably with cyclone.

LOWER ATMOSPHERE -- Generally, that part of the atmosphere in which most weather phenomena occur (the troposphere and lower stratosphere); hence, used in contrast to the common meaning for the lower atmosphere. In other contexts, the term implies the upper troposphere.

M

MACHINE INSTRUCTION (computer) -- A code element which causes a predefined sequence of operations.

MACHINE LANGUAGE (computer) -- A language for writing instructions in a form to be executed directly by the computer. The language directly intelligible to the control section of the machine.

MACHINE ORIENTED LANGUAGE (computer) -- A programming language designed for a particular computer. Such a language could exist at one of several levels of sophistication, i.e., binary, octal or symbolic operations with absolute, relative or symbolic addresses. The distinguishing characteristic of this language is that usually one line or unit of coding specifies one instruction in the computer.

MACHINE RUN (computer) -- The execution of one or several machine routines which are linked to form one operating unit.

MACHINE WORD (computer) -- A unit of information having a defined number of characters which a machine regularly handles in each register. For example: a machine may regularly handle numbers of instructions in units of 36 binary digits. This is then the machine word.

MACH NUMBER -- The ratio of the air speed of an object to the speed of sound in the same environment.

MACRO INSTRUCTION (computer) -- A source language statement which can produce a variable number of machine instructions.

MACROPROGRAMMING (computer) -- The process of writing machine procedure statements in terms of macro instructions.

MAGAZINE -- A container for roll film or paper which is attached to a camera or an oscillograph recorder during operations. (See **cassette**.)

MAGIC TEE -- A compound waveguide or coaxial tee with four arms which exhibits directional characteristics, when properly matched, such that a signal entering one arm will be split between two of the other arms but not the third. A signal entering another arm is likewise split with half the energy entering one of the arms common to the other input, but not its second arm. The other half of the energy enters the arm not used by the other input, thereby providing up to 40 dB of isolation between the two uncommon output arms. Used in radar as a transmitter-receiver duplexer.

MAGNETIC CORE (computer) -- A small doughnut-shaped ferrite designed and constructed for on and off magnetization and used to store information in the computer.

MAGNETIC DAMPING -- Damping accomplished through the generation and dissipation of electromagnetic energy.

MAGNETIC DECLINATION -- The bearing (reckoned east or west from the north branch of the celestial meridian plane) of magnetic north as determined by the positive pole of a freely suspended magnetic needle which is subject to no transient artificial disturbance. In nautical and aeronautical navigation, the term "variation" is used instead of "declination", and the angle is called "variation of the compass" or "magnetic variation."

MAGNETIC OXIDE COATING -- A thin layer of finely powdered crystalline, oxidized, ferro-magnetic particles bonded to a specially prepared backing or film.

MAGNETIC RECORDER/REPRODUCER -- A machine which converts electrical data signals to magnetic patterns on a magnetic tape during a recording process and/or converts the remanent magnetic patterns on a magnetic tape to electrical data signals during a reproducing process.

MAGNETIC TAPE -- A tape impregnated with a magnetic material on which polarized patterns representing information can be stored. Magnetic tape may be produced in digital or analog form.

MAGNETIC VARIATION -- Regular or irregular change with time of magnetic declination, dip or intensity. In nautical and aeronautical navigation, and in some localities when referring to surveying, the term "variation" is used instead of "magnetic declination". The regular variations are secular. The change from year to year which usually extends for many decades in the same direction is annual, having a period of 1 year, and diurnal, having a daily period. When severe, the irregular variations are known as magnetic storms. Locally, the magnetic field may be affected by dc voltage and other artificial disturbances. It was once a common practice of surveyors to denote as variation the net amount by which the compass departed from the direction taken as north in the description of a particular line, even when this was known to be slightly at variance with the celestial meridian.

MAGNETOELECTRIC TRANSDUCER -- A transducer which measures electromotive force generated by the movement of a conductor relative to a magnetic field.

MAIN FRAME -- The main part of the computer, i.e., the arithmetic or log unit; the central processing unit.

MANDATORY LEVEL; MANDATORY SURFACE -- One of several constant-pressure levels in the atmosphere for which a complete evaluation of data derived from upper-air observations is required. The radiosonde code has specific blocks reserved for these data. To have a more complete vertical picture, a significant level of radiosonde observations is also evaluated.

MANGIN (lens mirror) -- A negative meniscus lens reflection coated on the convex surface. (See **catadioptric**.)

MAP PROJECTION-- An orderly system of lines on a plane representing a corresponding system of imaginary lines on an adopted terrestrial or celestial datum surface. Also, the mathematical concept of such a system. The lines are classified according to the characteristics which they preserve as conformal, equal area, azimuthal, etc.; according to the methods used in their development as polyconic, gnomonic, stereographic, etc.; and according to the names of their authors, often coupled with some characteristic, as Mercator, Bonne, Lambert with two standard parallels, etc. The various map projections are defined under their particular designations.

Aitoff equal-area -- A Lambert equal-area azimuthal projection of a hemisphere converted into, a map projection of the entire sphere by a manipulation suggested by Aitoff. It is a projection bounded by an ellipse in which the line representing the equator (major axis) is double the length of the line representing the central meridian (minor axis).

Albers conical equal-area -- An equal-area map projection of the so-called conical type on which geographic meridians are represented by straight lines which meet at a common point. This point serves as the center of a series of arcs of circles which represent the geographic parallels. Meridians and parallels intersect in right angles. Along two selected parallels, called "standard parallels," the scale is held exact. Along the other parallels, the scale varies with the latitude but is constant along any given parallel. Between the standard parallels the meridional scale is too great; beyond them, too small. At any point on the projection, the departure from exact scale along a parallel is of the opposite sign from the departure from exact scale along the meridian, and the two are so related as to produce an equal-area map projection. Passing through every point are two lines of true-length scale which intersect in right angles; these are called isoperimetric curves.

MAP PROJECTION -- (continued)

Aphylactic -- A map projection which is neither a conformal map nor an equal-area map projection but contains elements of both.

Authalic -- An equal-area map projection.

Azimuthal; zenithal -- A map projection on which the azimuths or directions of all lines radiating from a central point or pole are the same as the azimuths or directions of the corresponding lines on the sphere. As a class, azimuthal map projections include a number of special projections which are described under their particular designations. An azimuthal map projection may be constructed having two poles or points, lines from which are shown in correct azimuth. Such a projection is called a "doubly azimuthal map projection."

Azimuthal equidistant -- An azimuthal map projection on which straight lines radiating from the center or pole of projection represent great circles in their true azimuths from that center, and lengths along those lines are of exact scale. This projection is neither equal-area nor conformal.

Bonne -- A modified equal-area map projection of the so-called conical type, having lines representing a standard parallel and a central meridian intersecting near the center of the map. The line representing the central geographic meridian is straight and the scale along it is exact. All geographic parallels are represented by arcs of concentric circles at their true distances apart, divided to exact scale, and all meridians except the central are curved lines connecting corresponding points on the parallels. This projection is strictly equal-area. A particular form of this projection is the Sanson-Flamsteed or sinusoidal map projection, in the construction of which the equator is used as the standard parallel.

Lambert conformal conic -- A conformal map projection of the so-called conical type on which all geographic meridians are represented by straight lines which meet in a common point outside the limits of tile map and the geographic parallels are represented by a series of arcs of circles having this common point for a center. Meridians and parallels intersect in right angles, and angles on the earth are correctly represented on the projection. This projection may have one standard parallel along which the scale is held exact or there may be two such standard parallels, both maintaining exact scale. At any point on the map, the scale is the same in every direction. It changes along the meridians, and is constant along each parallel. Where there are two standard parallels, the scale between those parallels is too small; beyond them, too large. The Lambert conformal conic map projection with two standard parallels is the base for the State coordinate systems devised by the

MAP PROJECTION -- Lambert conformal conic -- (continued)

United States Coast and Geodetic Survey for zones of limited north-south dimension and indefinite east-west dimension. In those systems, the standard parallels are placed at distances of one-sixth the north-south width of the map from its upper and lower limits.

Mercator -- A conformal map projection of the so-called cylindrical type. The Equator is represented by a straight line true to scale. The geographic meridians are represented by parallel straight lines perpendicular to the line representing the Equator, and are spaced according to their distance apart at the Equator. The geographic parallels are represented by a second system of straight lines perpendicular to the family of lines representing the meridians and, therefore parallel with the Equator. Conformality is achieved by mathematical analysis, the spacing of the parallels being increased with increasing distance from the Equator to conform with the expanding scale along the parallels resulting from the meridians being represented by parallel lines.

Polyconic -- A map projection having the central geographic meridian represented by a straight line along which the spacing for lines representing the geographic parallels is proportional to the distance apart of the parallels. The parallels are represented by arcs of circles which are not concentric, but whose centers lie on the line representing the central meridian and whose radii are determined by the lengths of the elements of cones which are tangent along the parallels. All meridians except the central one are curved. This projection is neither conformal nor equal-area, but it has been much used for maps of small areas because of the ease with which it can be constructed. It is the map projection used for the topographic map of the United States Geological Survey, and in a modified form is used for maps of large areas.

Transverse Mercator -- A map projection of the so-called cylindrical type, being in principle equivalent to the regular Mercator map projection turned (transversed) 90° in azimuth. In this projection, the central meridian is represented by a straight line corresponding to the line which represents the Equator on the regular Mercator map projection. Neither the geographic meridians (except the central meridian) nor the geodetic parallels (except the Equator), if shown, are represented by straight lines. It is a conformal projection, and is the base used in the State plane-coordinate systems for the grids of those zones whose greater dimension is in a north-south direction.

MAP SCALE -- The relationship which exists between a distance on a map and the corresponding distance on the earth. A map scale may be expressed as an equivalence, as a numerical fraction or ratio, or shown graphically. On large-scale maps, the distance on the earth is on a designated datum such as sea level or ground level.

MARK SENSE (computer) -- To mark a position on a punched card with an electronically-conductive pencil, for later conversion to machine punching.

MASER -- (See **microwave amplification by stimulated emission of radiation**.)

MASK (computer) -- 1. A fixed word pattern of bits and characters used for the purpose of selecting or eliminating parts of other words. **2.** To extract a selected group of characters from a string of characters.

MASTER CLOCK -- The primary source of timing signals used to control the timing of pulses.

MATHEMATICAL PROGRAMMING -- (See **linear programming**.)

MEACONING -- A system of transmitting actual or simulated radio navigational signals for the purpose of confusing navigation. For example, meaconing stations can cause inaccurate bearings to be obtained by aircraft, ships or ground stations.

MEAN HIGH OR LOW WATER -- The mean height of all high or low waters at a particular point or station over a considerable period of time. For tidal waters, the cycle of change covers a period of about 18.6 years, and the mean high or low water is the mean of all high or low waters for that period. For any body of water, it is the mean of all high or low waters over a period of time of such length that increasing its length does not appreciably change the mean.

MEAN SEA LEVEL (MSL) -- The average height of the sea for all stages of the tide. Mean sea level is obtained by averaging observed hourly heights of the sea on the open coast or in adjacent waters having free access to the sea, the average being taken over a considerable period of time.

MEASURAND -- A physical or electrical quantity, property or condition which is measured. The term "measurand" is preferred over entity, excitation, parameter to be measured, physical phenomenon, stimulus and variable.

MEMORY (computer) -- Any device into which information can be introduced and them extracted at a later time.

MEMORY CAPACITY (computer) -- The amount of information which a memory unit can store; often measured in decimal or binary digits. Other measures of memory capacity have also been defined, such as the number of words of a specified length.

MEMORY DUMP (computer) -- (See **storage dump**.)

MERCATOR TRACK -- A rhumb line on a map or chart constructed on a Mercator map projection.

MERIDIAN -- A north-south line from which longitudes (or departures) and azimuths are reckoned, or a plane normal to the geoid or spheroid defining such a line.

Astronomic -- A line on the surface of the earth leaving the same astronomic longitude at every point. Because the deflection of the vertical is not the same at all points, an astronomic meridian is an irregular line not lying in a single plane. The astronomic meridian and the line whose astronomic azimuth at every point is south or north (0° or 180°) are not necessarily coincident, although in land surveying the term "astronomic meridian" is sometimes applied to the north-south line which has its initial on a prescribed astronomic meridian.

Auxiliary Guide (United States public-land surveys) -- A new guide meridian established for control purposes where the original guide meridians were placed at intervals greater than 24 miles. Auxiliary guide meridians may be required to limit errors of old surveys or to control new surveys. They are surveyed in all respects like regular guide meridians, and may be assigned a local name.

Celestial -- The hour circle which contains the zenith. Also defined as the vertical circle which contains the celestial pole. The plane of the celestial meridian is parallel with, but due to the deflection of the plumb line usually does not contain the axis of rotation of the earth; its intersection with the plane of the horizon is the meridian line used in plan surveying.

Central (State coordinate system) -- The meridian used as axis of Y for computing projection tables for a state coordinate system. The central meridian of the system usually passes close to the center figure of the area or zone for which the tables are computed, but to avoid the use of negative values, is given a large positive abscissa, thus requiring that a large constant quantity be added to all X coordinates.

MERIDIAN -- (continued)

Geodetic -- A line on a spheroid which has the same geodetic longitude at every point. If the spheroid is an ellipsoid of revolution, as used for purposes of triangulation, a geodetic meridian is an ellipse whose plane contains the minor axis of the spheroid, and its geodetic azimuth at every point is 0° south or 180° north.

Geographic -- A general term applying alike to an astronomic or a geodetic meridian.

Greenwich -- The astronomic meridian through the center of the transit instrument of the observatory of Greenwich, England.

Grid -- A line through a point parallel to the central meridian of axis of Y of a system of plane-rectangular coordinates.

Prime -- The initial or zero meridian from which other meridians are reckoned.

MERIDIAN DISTANCE --

Astronomy -- The hour angle of a celestial body when close to but not exactly on the astronomic meridian. This is limited to computation forms when used to designate the hour angle of a star observed slightly off the meridian in making latitude observations by the zenith telescope method.

Plane Surveying -- The perpendicular distance in a horizontal plane of a point from a meridian or reference. The difference of the meridian distances of the ends of a line is called the "departure of the line".

MERIDIONAL WIND -- The wind or wind component along the local meridian, as distinguished from the zonal wind. In a coordinate system fixed locally with the x-axis directed eastward and the y-axis directed northward, the meridional wind is positive if from the south and negative if from the north.

MESOPAUSE -- The top of the mesophere. This corresponds to the level of minimum temperature at 70 to 80 km.

MESOSPHERE -- The atmospheric shell between about 55 km and about 70 to 80 km, extending from the top of the stratopause to the upper temperature minimum (the mesopause). It is characterized by a decreasing temperature ranging from approximately 0° Centigrade at the stratopause to approximately 90° at the mesopause.

METEOROLOGICAL ROCKET; ROCKETSONDE -- A rocket designed primarily for routine upper-air observation (as opposed to research) in the lower 250,000 feet of the atmosphere, especially that portion inaccessible to balloons, i.e., above 100,000 feet.

METER; METRE -- A unit of length equivalent in the United States to 39.37 inches. At the Seventh General (International) Conference on Weights and Measures, Paris, 1927, the following supplementary value of the meter was temporarily adopted: 1 meter=1,553,164.13 wavelengths of the red ray of Cadmium vapor, in dry air, at a temperature 15° Centigrade, at a pressure of 760 millimeters of mercury, and under normal conditions of gravity.

METRIC PHOTOGRAPHY -- The recording of events by means of photography, either singly or sequentially, together with appropriate coordinates to form the basis for accurate measurements.

METRIC TRAJECTORY DATA -- A record of a test vehicle's space position versus time. In addition to position versus time, metric trajectory data often includes velocity, range rate, acceleration roll, pitch, yaw, and other parameters of motion versus time. Some data associated with metric trajectory data (impact predictions, mach number, Reynolds number, dynamic pressure, engine gimbal, etc.) are classified as "derived" metric data because they have been computed by advanced techniques or obtained by combining metric data with weather or other external data and do not constitute direct observations.

METROGON LENS -- A wide-angle lens for aerial cameras used in mapping, charting and reconnaissance photography. Composed of four elements with airspaces between the elements and no cemented surfaces.

MICROLOCK -- A satellite telemetry system which uses phase-lock techniques in the ground receiving equipment to achieve extreme sensitivity.

MICROPHOTOGRAPHY -- A process for making minute, precision photographs of an object or small pictures of large subjects. (See **photomacrography**.)

MICROPROGRAMMING (computer) -- Machine language coding in which the coder builds his own machine instructions from the basic instructions built into the hardware.

MICROWAVE AMPLIFICATION BY STIMULATED EMISSION OF RADIATION (MASER) -- A solid state amplifier operating at near absolute zero which derives amplification power from an auxiliary microwave power source. The auxiliary microwave power source is used to excite molecules to a higher

energy level. Overpopulated intermediate energy levels give energy to the correct signal frequency resulting in amplification of the input signal.

MICROWAVE REFRACTOMETER -- A device for measuring the refractive index of the atmosphere at microwave frequencies, usually in the 3-cm region.

MICROWAVE REGION -- Commonly, that region of radio spectrum between 1,000 MHz and 300,000 MHz. Corresponding wavelengths are 30 cm to 1 mm.

MICROWAVE TURBULENCE -- Irregular and fluctuating gradients of microwave refractive index in the atmosphere. Microwave turbulence may be due either to uneven distribution of water vapor or to thermal disturbance. (See **optical turbulence**.)

MIL -- 1. A unit of angular measurement equal to 1/6,400 of the circumference of a circle. **2.** In artillery, the angle subtended by a tangential distance of 1 yard at a radial distance of 1,000 yards.

MILE, NAUTICAL -- As used in ocean navigation, the United States nautical mile is defined as equal to one-sixtieth of a degree of a great circle on a sphere whose surface is equal to the surface of the earth. Its value, calculated for the Clarke spheroid of 1886, is 1,853.248 meters (6,080.20 feet). The international nautical mile is 1,852 meters (6,076.10 feet). The United States nautical mile is also called a sea mile or a geographical mile, and may be taken as equal to the length of a minute of arc along the Equator or a minute of latitude on the map which is being measured.

MILLIBAR -- A pressure unit of 1,000 dynes per cm , convenient for reporting atmospheric pressures.

MILLIGAL -- (See **gal**.)

MINITRACT -- A satellite tracking system which uses a miniature pulse type telemeter and a precise directional antenna system with phase comparison tracking techniques.

MISFIRE (safety) -- A condition wherein the firing pulse is known to have left the firing barricade and energized the fire control circuit, but does not ignite the propulsion system.

MISS DISTANCE -- 1. The closest distance between two objects having relative motion, e.g., a guided missile intercepting a target. **2.** The great-circle distance between the observed impact point and the intended impact point.

MISS DISTANCE INDICATOR (MDI) -- A system for detecting, displaying and/or recording the miss distance between two objects.

MISSILE HAZARD SPACE (safety) -- The missile hazard space is a volume originating at the launch point within which a vehicle or its fragments will be contained either as a result of its maximum aerodynamic/ballistic capability or controlled flight termination. The missile hazard space will vary according to the characteristics of the particular vehicle involved and/or the range safety limitations imposed for flight termination and must be specifically prescribed for each missile launch operation.

MISSILE IMPACT LOCATION SYSTEM (MILS) -- An instrumentation system consisting of underwater hydrophones designed to detect and locate the impact point of a missile and other re-entry objects.

MISSILE INTERCEPT DATA ACQUISITION SYSTEM (MIDAS) -- Multiplexed Bi-COTA. A system in which two complete COTAR antenna systems and two sets of receivers at each station are used in tracking more than one object at a time following multiplexing which is accomplished after phase comparison.

MISSILE RANGING (MIRAN) -- An obsolete pulse-type system that measures loop ranges from a transmitter to a beacon, to remote slave stations, and back to the transmitter by comparing time differences. The transmitter interrogates at 600 MHz and the beacon replies at 580 MHz.

MISSION (safety) -- A scheduled activity at a test area under one of the following categories: **1.** Hot mission -- A test or training mission or other activity which, by reason of hazards involved, precludes any other simultaneous range operation. **2.** Cold mission -- A mission determined to be nonhazardous, or ground party activity for the purpose of work on or access through the test area, both of which will safely allow simultaneous or joint nonfiring operations.

MIXING RATIO -- In a system of moist air, the dimensionless ratio of the mass of water vapor to the mass of dry air. For many purposes, the mixing ratio may be approximated by the specific humidity. In terms of the pressure, p, and vapor pressure, e, the mixing ration, w, is:

$$w = \frac{0.622e}{p - e}$$

MNEMONIC -- A technique to assist the human memory. A mnemonic code resembles the original word and is usually easy to remember, e.g., "MPY" for multiply and "ACC" for accumulator.

MODE -- 1. A method of operation, e.g., the binary mode, the interpretive mode, the alphanumeric mode, etc. **2.** The most frequent value in the statistical sense.

MODEL ATMOSPHERE -- Any theoretical representation of the atmosphere, particularly of vertical temperature distribution.

MODIFIED REFRACTIVE INDEX -- (See **refractivity**.)

MODULATION -- 1. The process of varying the amplitude, the frequency, or the phase of a carrier wave in accordance with other signals. **2.** The process of impressing information on a carrier for transmission.

Amplitude (AM) -- **1.** Modulation in which the amplitude of a wave is the characteristic subject to variation. **2.** Those systems of modulation in which each component frequency (f) of the transmitted intelligence produces a pair of sideband frequencies at carrier frequency plus (f) and carrier frequency minus (f). **3.** In special cases, the carrier may be suppressed; either the lower or upper sets of sideband frequencies may be suppressed; the lower set of sideband frequencies may be produced by one or more channels of information, and the upper set of sideband frequencies may be produced by one or more other channels of information. The carrier may be transmitted without intelligence-carrying sideband frequencies (Aϕ). The resulting emission bandwidth is proportional to the highest frequency component of the intelligence transmitted.

Amplitude, effective, percentage, -- The ratio of the peak value of the, ac component to the dc component in the modulated condition, expressed in percent.

Angle -- Modulation in which the angle of a sine wave carrier is the characteristic varied. Phase and frequency modulation are particular forms of angle modulation.

Frequency (FM) -- Modulation in which the instantaneous frequency of a sine-wave carrier is caused to depart from the carrier frequency by an amount proportional to the instantaneous value of the modulating wave.

FM/AM -- Amplitude modulation of a carrier by subcarriers which are frequency modulated by information.

FM/FM -- Frequency modulation of a carrier by subcarriers which are frequency modulated by information.

MODULATION -- (continued)

FM/PM -- Phase modulation of a carrier by subcarriers which are frequency modulated by information.

High-level -- Modulation produced at a point in a system where the power level approximates that of the output of the system.

Low-level -- Modulation produced at a point in a system where the power level is low compared with the power level at the output of the system.

Multiple -- Modulation in which the modulated waveform becomes the modulator for the next wave.

Phase (PM) -- Angle modulation in which the angle of a sine-wave carrier is caused to depart from the carrier angle by an amount proportional to the instantaneous value of the modulating wave.

Pulse -- Unquantized modulation of a pulse train such that the amplitude, duration, position, time, or frequency of occurrence of the pulse is caused to vary in accordance with some impressed signal.

Pulse amplitude (PAM) -- Modulation in which a wave is caused to control the amplitude of a pulse carrier.

PAM/FM -- Frequency modulation of a carrier by pulses which are amplitude modulated by information.

Pulse code (PCM) -- **1.** That form of pulse modulation in which a code is used to represent quantitative values of instantaneous samples of signal wave. In PCM telemetry, information transmission by means of a code representing a finite number of values of the information at the time of sampling. **2.** A time division multiplex technique in which the modulated variable (amplitude, frequency, phase) assumes one of a predetermined set of discrete levels in each pulse interval, and groups of pulses thus formed are arranged to produce a code. PCM pulse trains may be organized into various format units such as syllables, characters, words, frames, etc.

PCM/FM -- Frequency modulation of a carrier by pulse code modulated information.

MODULATION -- (continued)

Pulse code (PCM) -- (continued)

PCM/FM/FM -- Frequency modulation of a carrier by subcarriers which are frequency modulated by pulse code modulated information.

PCM/PM -- Phase modulation of a carrier by pulse code modulated information.

PCM, parallel -- A PCM technique in which the pulses are transmitted simultaneously over parallel channels and are usually detected by sampling all received outputs at the same instant. This technique is often encountered in magnetic tape recording. A simultaneous group of pulses may be referred to as a character or a word.

PCM, serial -- PCM transmission in which a single data channel is used and the pulse code signals are received in sequential order.

Pulse Duration (PDM) -- Formerly known as pulse width modulation (PWM).

PDM/FM -- Frequency modulation of a carrier by subcarriers which are frequency modulated by pulses which are modulated in duration by information.

PDM/FM/FM -- Frequency modulation of a carrier by subcarriers which are frequency modulated by pulses which are time duration modulated by information.

PDM/PM -- Phase modulation of a carrier by pulses which are duration modulated by information.

Pulse frequency -- Modulation in which the pulse repetition frequency of the carrier is varied in accordance with the amplitude and frequency of the modulating signal.

Pulse position (PPM) -- PPM/AM - Amplitude modulation of a carrier by pulses which are position modulated by information.

Pulse time (PTM) -- Modulation in which the value of instantaneous samples of the modulating waves are caused to modulate the time of occurrence of some characteristic of a pulse carrier.

MODULATION FACTOR -- The ratio of the peak variation actually used to the maximum design variation in a given type of modulation system.

MODULATION INDEX -- In angle modulation with a sinusoidal modulating wave, the ratio of the frequency deviation to the frequency of the modulating wave.

$$m = \frac{\Delta f \quad where \quad \Delta f}{f_{max}}$$

where Δf is the maximum frequency difference between the modulated carrier and the unmodulated carrier and f_{max} is the maximum modulation frequency.

MODULATOR -- A device for placing an intelligence signal on a carrier wave.

Balanced -- A device in which the carrier and modulating signal are so introduced that the modulated output contains the two sidebands without the carrier.

Pulse position -- A device which converts analog information to variations in pulse position.

MODULATOR-DEMODULATOR (MODEM) -- The acronym MODEM is used in referring to the portion of a carrier terminal in which the modulator and demodulator circuits are mounted together on a single panel and may have common elements.

MODULE -- A combination of components or circuitry packaged together or mounted on the same base, and capable of performing a complete function.

MODULO -- A mathematical operator. Let M be an integer. Then, two integers a and b are congruent modulo m if, and only if, there exists an integer k such that a-b=km. Thus a=b (mod m), and m is called the modulus of the congruence. The property of the modulo is used in computer programming as a checking technique.

MODULUS -- 1. A constant or coefficient that expresses numerically the degree in which a property is possessed by a substance or body. **2.** The absolute value of a complex number; an integer (as X) whose relationship to two other integers (as Y and Z) is such that Y minus A divided by X is a whole number.

MOLECULAR-SCALE TEMPERATURE -- A temperature parameter T_M defined by the following relation:

$$T_M = T\frac{M_o}{M}$$

where T is the actual kinetic temperature, M the molecular weight of air at sea level (28,966), and M the molecular weight of air at the point being specified. Molecular scale temperature has application in specifying temperatures at extremely high altitudes. Below about 90 km, T_M=T. But above that level, T_M becomes increasingly greater than T.

MONITOR (computer) -- To control the operation of several unrelated routines and machine runs so that the computer and computer time are used advantageously.

MONOPULSE (radar) -- The derivation of azimuth and elevation error signal from a single pulse of received RF energy.

MONTH -- A measure of time based on the motion of the Moon in its orbit.

Anomalistic -- The interval of time between two successive passages of the Moon in its orbit through perigee.

Calendar -- A division of the year, as determined by a calendar, approximately one-twelfth of a year in length. While arbitrary in character, the calendar month is based roughly on the synodical month. The calendar month ranges in length from 28 to 31 mean solar days.

Lunar -- A synodical month.

Nodical -- The interval of time between two successive passages of the Moon through the same node of its orbit. The length of the nodical month averages 27.21222 mean solar days.

Sidereal -- The interval of time it takes the Moon to make its revolution from a given star back to the same star again. The sidereal month may be measured by the interval of time it takes the Moon to revolve from a given celestial longitude back to the same longitude again, observed from a fixed equinox. The length of the sidereal month averages 27.321661 mean solar days. Because of perturbations, the actual length varies some 7 hours. The difference between the lengths of the sidereal and tropical months is due to the precession of equinoxes. The above definition is not precise: the Moon will not return to the same declination at the end of the sidereal month.

MONTH -- (continued)

Synodical (ordinary) -- The interval of time between two successive conjunctions of the Moon (new moons) or oppositions (full moons). Also called a "lunation". The length of the synodical month is 29.530588 mean solar days. It is the month intended when a lunar month is specified. The term "synodical" is preferred over "synodic".

Tropical -- The interval of time it takes the Moon to make its revolution from a given equinox back to the same equinox. The tropical month may be measured by the interval of time it takes the Moon to revolve from a given celestial longitude back to the same longitude, observed from an equinox affected by precession. The length of the tropical month averages 27.321582 mean solar days. Because of perturbations, the actual length varies some 7 hours. The difference between the lengths of the sidereal and tropical months is due to the precession of the equinoxes.

MOTORBOATING -- A sound resembling that of a motorboat heard through the monitoring system speaker of an audiomodulated radiosonde when the audio signal becomes low in frequency.

MOUNTING ERROR -- The error resulting from mechanical deformation of the transducer caused by mounting the transducer and making all measurand and electrical connections.

MOUNT, TRACKING -- A mechanism that can traverse in azimuth and elevation to provide a means for instruments to follow moving objects.

MOVING IMPACT POINT (safety) -- The impact point as calculated from the conditions at any instant of time during that portion of the flight of the missile when external forces are still active.

MOVING TARGET INDICATOR -- A method for displaying radar echoes which discriminates between fixed and moving targets.

MULTICOUPLER -- A device for connecting several receivers to one antenna and properly matching the impedances of the receivers and the antenna.

MULTIPLE AIRBORNE TARGET TRAJECTORY SYSTEM (MATTS) -- A long-baseline angle-measuring system consisting of two crossed-baseline AME stations. Each AME simultaneously tracks three airborne targets by means of frequency sharing.

MULTIPLE INTERFEROMETER DETERMINATION OF TRAJECTORIES (MIDOT) -- A trajectory measurement system with multiple object tracking capability using two or more short baseline stations and producing a data output consisting of a series of amplitude nulls that represent direction cosines at given times in the flight.

MULTIPLE OBJECT PHASE TRACKING AND RANGING (MOPTAR) -- A short baseline, continuous wave phase comparison system, similar to the COTAR, which consists of a cross baseline AME system and a DME, wherein time sequencing of the ground station and transponders is used to track multiple targets.

MULTIPLEXING -- 1. The simultaneous transmission of two or more signals within a single channel. The three basic methods of multiplexing involve the separation of signals by time division, frequency division and phase division. **2.** The division of a transmission facility into two or more channels.

MULTIPLIER-QUOTIENT REGISTER (computer) -- A register in which the multiplier for multiplication is placed and in which the quotient for division is developed.

MULTIPROCESSOR (computer) -- A machine with arithmetic and logic units for simultaneous use.

M-UNIT -- (See **refractivity**.)

N

NADIR -- The point where the direction of the plumb line extended below the horizon meets the celestial sphere. The nadir is directly opposite the zenith.

NANO -- A prefix denoting one billionth (1×10^{-9}=0.000000001).

NARROW-SECTOR RECORDER -- A radio direction finder with which atmospherics are received from a limited sector related to the position of the antenna. The antenna is usually rotated continuously and the bearing of the atmospherics recorded automatically.

NEAR REAL TIME -- A term which denotes a function or task that is performed shortly after a physical event and in response to that event. There is no exact length of time delay that divides "near real time" from "real time." The distinction is somewhat subjective, and is based on the nature of the physical system. "Real time" is often reserved for systems in which the only delays are caused by the speed of light, electron transit time, or digital computer processing speeds; whereas, "near real time" is used to describe systems with appreciable mechanical or human reaction time delays.

NEGATE (safety) -- Stop the operation and recycle the count back to a convenient pickup point.

NEGATIVE LENS -- A lens which will diverge a beam of parallel light rays, no real focus being obtained.

NET (geodetic) -- A series of lines or levels which have been interconnected in such a manner that closed loops or circuits have been formed.

NETWORK ANALYZER -- An analog device designed primarily for simulating electrical networks.

NEUTROSPHERE -- The atmospheric shell from the Earth's surface upward in which the atmospheric constituents are for the most part unionized, i.e., electrically neutral. The region of transition between the neutrosphere and the ionosphere is somewhere between 70 and 90 km, depending on latitude and season.

NIXIE -- A neon glow tube which, with switching circuits, displays coded information in the form of a decimal number. Used in some radars for displaying binary information in an octal number.

NO-ACTION ZONE (safety) -- An area in the overflight of a vehicle during which no safety action can be taken without violating the flight test area of the missile.

NODAL POINTS -- Two points on the axis of a lens such that a ray of light passing through one of them leaves the lens as if it originated in the other. Often referred to as first and second, front and rear, or object and image space. In metric photography, the front nodal point is a center of perspective for objects photographed and is the nodal point from which reference targets are surveyed; also called "nodes".

NOISE -- Any unwanted disturbance or spurious signal which modifies the transmission, indication or recording of the desired data.

Amplitude of -- When impulse noise occurs randomly and is so closely spaced that the individual waveshapes are not separated by the receiving equipment, the noise has the waveshape and characteristics of random noise. Random noise amplitude is proportional to the square root of the bandwidth. If the impulses are separated, the noise no longer has the waveshape of random noise and its amplitude is directly proportional to the bandwidth of the transmission system.

Electrical -- Unwanted electrical energy other than cross talk present in a transmission system.

Gaussian -- A noise whose power has a normal (Gaussian) distribution.

Impulse -- Noise generated in discrete energy bursts which has a characteristic waveshape of its own.

In measurements -- Generally, random errors and other errors that have a relatively high frequency (short period) compared to that of other errors such as most systematic errors and as compared to the highest frequency component of the phenomenon observed.

Random -- Noise in which the frequency and phase of the components vary at random, characterized by a peak-to-average-noise-level ratio in the order of 4:3 to 5:4. This is broadband noise; thermal and shot noise are typical.

White -- A noise whose power is distributed uniformly over all ,frequencies, and has a mean noise power per unit bandwidth. Since idealistic white noise is an impossibility, bandwidth restrictions must be applied.

NOISE FIGURE -- The ratio of the equivalent input noise power of a receiver to the component of the input noise power from the antenna radiation resistance. The noise figure is a power ratio usually expressed in decibels and measured by inserting enough noise signal to double the receiver noise output. A comparison of this level to the theoretical minimum gives a noise figure measurement. The noise input of a theoretical perfect receiver is given as $(dB)=\log_{10}(1/KT\Delta f)$ where K is 1.374×10^{-23} watt-second per degree Kelvin. (T is the temperature in degrees Kelvin and Δf is the bandwidth of the receiver.)

NOMINAL -- In test range jargon, a term which means: **1.** Substantially as designed or planned; with slight deviation from expectations; essentially normal. **2.** Planned; design center-value; expect; anticipated. **3.** Also used as an adverb (the test vehicle behaved nominally).

NOMINAL BIT RATE (telemetry) -- Bit rate established as a specific system design center.

NOMINAL RANGE -- (See **rated range**.)

NON-COOPERATIVE MISSILE -- Scoring system is located in the target and requires no cooperative equipment in the missile.

NON-COOPERATIVE SCORER -- Does not require munition modification or augmentation for scoring purposes. (See **scorer**.)

NON-COOPERATIVE TARGET -- A target containing no cooperative equipment because the scoring system is located in the missile.

NONDESTRUCTIVE READ (computer) -- To copy information from a storage device without altering the physical representation in that device.

NONLINEARITY -- The maximum deviation of any calibration point from the corresponding point on a straight line during any calibration cycle.

NON RETURN TO ZERO LEVEL (NRZ-L) -- Recording wherein a flux change occurs each time the next bit differs from the preceding bit.

NON RETURN TO ZERO MARK (NRZ-M) -- Recording wherein a flux change occurs each time a new ONE bit is to be written.

NONVOLATILE STORAGE (computer) -- A storage medium which retains its information in the absence of power.

NOR -- The Boolean operator which gives a truth table value of true only when both of the variables connected by the logical operator are false; i.e., the negation of inclusive OR.

NOR-GATE -- A gate whose output is energized when and only when none of the inputs are in their prescribed state.

NORMAL -- 1. In general, a straight line perpendicular to a surface or to another line. Also, a condition of being perpendicular to a surface or line. **2.** In geodesy, a straight line perpendicular to the surface of the spheroid. While the term "normal" is correctly used to also designate a line perpendicular to the surface of the qeoid, the term "vertical" is preferred for such a line.

NORMAL CURVE -- A relative frequency curve that graphs as a symmetric, bell-shaped (Gaussian) curve.

NORMAL DISPERSION -- Dispersion characterized by an increase in refractive index with increase in frequency.

NORMAL EQUATIONS -- A set of equations derived through a minimization process by a method of least squares; used to obtain estimates of Parameters.

NORMALIZE -- To transform a random variable into a new random variable which follows a normal curve (distribution).

NORMAL LINEARITY - A manner of expressing linearity as deviation from a straight line in terms of a given percentage of the output at a certain stimulus value, usually the full-scale value.

NORMAL RECORD LEVEL -- The level of record-head current required to produce 1 percent 3rd harmonic distortion of the reproduced signal at the record level set frequency when the distortion is a function of magnetic tape saturation and is not a function of electronic circuitry.

NORMAL SECTION LINE -- A line on the surface of a spheroid, connecting two points on that surface, and traced by a plane containing the normal at one point and passing through the other point. There can be two such lines connecting any two points (as A and B) on the spheroid: one defined by the plane containing the normal at A and passing through B, the other containing the normal at B and passing through A. Where the two points are on the same parallel of latitude or on the same meridian of longitude, the two lines will be coincident.

NORTH -- The approximate direction of the North Pole from the observer.

Grid -- The northerly direction indicated by the arbitrary vertical line of a grid. Also, the northerly direction of the line through a point parallel to the Central Meridian or axis of Y of a system of plane-rectangular coordinates.

Magnetic -- The direction indicated by the north-seeking element of a magnetic compass when influenced only by the earth's magnetic field.

True -- The direction of the north celestial pole.

N-PLUS-ONE ADDRESS INSTRUCTION (computer) -- A multiple address of which one address specifies the location of the next instruction of the normal sequence to be executed.

NOTATION (arithmetic) -- A manner of representing numbers. If quantities are written in the scale of notation, n, then the successive positions of the digits report the powers of n. Thus, 378 in the scale of 10 or decimal notation means 3 hundreds, 7 tens and 8 ones; 1101 in the scale of 2 or binary notation means 1 eight, 1 four, no twos and 1 one; 764 in the scale of 8 or octal notation means 7 sixty-fours, 6 eights and 1 four.

NOTCH GATE -- One which appears as a negative deflection of the range baseline equal in width to the early and late gates.

NULL -- 1. A condition of balance which results in a minimum absolute value of output. **2.** To oppose an output which differs from zero by a counteraction which returns the output to zero. **3.** A lack of information, as contrasted with zero or blank for the presence of no information.

NULLO (safety) -- The unmanned or pilotless flight of a drone controlled by external guidance systems.

NUMBER SYSTEM -- The representation of a quantity by a positional value to a given number base, e.g., binary system for base 2, system for base 8, decimal for base 10, hexadecimal for base 16, etc. (See **notation, arithmetic**.)

NUMERICAL CONTROL -- That field of computer activity which centers around the control of machine tools by mechanical devices; e.g., a computer can control assembly line tools for machining.

NUMERIC CODING (computer) -- Coding which uses only digits to represent data and instructions.

NUMERIC PUNCH -- A punch in any of rows 1 through 9 on a punch card.

N-UNIT -- (See **refractivity**.)

NUTATOR (radar) -- A mechanical device which gyrates the antenna feed horn or dipole about the axis of the reflector without changing its polarization.

OBJECT ROUTINE (computer) -- A machine language routine which is the output after translation from the source language; the running routine; also called "object program".

OCCUPIED BANDWIDTH -- A frequency bandwidth where the mean powers radiated below its lower and above its upper frequency limits are equal to 0.5 percent of the total mean power radiated by a given emission.

OCTAL NUMBER SYSTEM -- A number system using the equivalent of the decimal integer 8 as a base.

OCTAVE -- The interval between two frequencies having a ratio of 2:1.

ODD-EVEN-CHECK -- A 1-bit parity check.

OFF-LINE (computer) -- Devices or auxiliary equipment not under direct control of the central processing unit.

ONE-SIGMA DISPERSION -- According to probability theory, the error below which approximately 68 percent of all samples of the data will fall, assuming a Gaussian distribution. (See **standard deviation**.)

ON-LINE DATA REDUCTION -- Reduction of data as fast as the data flows into the reduction process. (See **real-time operations**.)

OPENING DWELL (ballistic camera) -- Time interval between energizing the opening solenoid and the beginning of actual opening (clearance closing position) in a capping) shutter.

OPEN LOOP DESTRUCT CHECKS (safety) -- Operational checks of the flight termination system using electromagnetic radiation between transmitting and receiving antennas.

OPENING TIME (ballistic camera) -- Time interval required by capping shutter blades to reach the clearance opening position from a full closed position. Opening time = opening dwell + opening transport.

OPENING TRANSPORT (ballistic camera) -- Time intervals between the clearance closing position and the clearance opening position during the opening cycle of a capping shutter.

OPEN ROUTINE (computer) -- A routine which can be inserted directly into a larger routine without a linkage or calling sequence.

OPEN SHOP -- A computing installation at which computer programming, coding and operating can be performed by any qualified company employee.

OPERAND (computer) -- The address or name portion of an operation; e.g., X is the operand of the operation 'add X.'

OPERATION (computer) -- 1. A combination of at least one operator and one operand, e.g., 'add X.' **2.** The process of executing a defined action. **3.** Occasionally used in reference to the operation code or operator.

Fixed-cycle -- A type of computer performance in which a fixed amount of time is allocated to an operation; synchronous or clocked type arrangement within a computer in which events occur as a function of measured time.

Logical -- An operation in which logical (yes-or-no) quantities form the elements being operated on, e.g., comparison, extraction. A usual requirement is that the value appearing in a given column of the result shall not depend on the values appearing in more than one given column of each of the arguments.

On-line -- A type of system application in which the input data is fed directly to the measuring devices and the computer results are obtained during the progress of the event; e.g., a computer receives data from wind tunnel measurements during a run, and the computations of dependent variables are performed during the run enabling a change in the conditions which produces desirable results.

Real-time; simulated -- The processing of data in synchronization with a physical process in such a fashion that the results of the data processing are useful to the physical operation.

Serial -- The flow of information through a computer in time sequence, using only one digit, word, line or channel at a time. Contrasted with parallel operation.

Transfer -- An operation which moves information from one storage location or one storage medium to another, e.g., read, record, copy, transmit, exchange. Transfer is sometimes taken to refer specifically to movement between different media; storage to movement within the same medium.

OPERATION (computer) -- (continued)

Variable cycle -- Computer action in which any operation or cycle of action may be of different lengths. Action of this type is peculiar to a synchronous computer.

OPERATION CODE (computer) -- That part of an instruction which designates the operation of arithmetic, logic or transfer to be performed.

OPERATION CYCLE (ballistic camera) -- One which takes place whenever the capping shutter blades move from a fully closed or open position to a fully open or closed position, and return to the original position.

OPERATOR (computer) -- The what-to-do portion of an operation; e.g., 'add' is the operator of the operation 'add x.'

OPTICAL AXIS (radar) -- A line parallel to, but offset from, the electrical axis of an antenna. This axis is offset by the distance necessary to have the optical sighting device removed from the electrical center of the antenna.

OPTICAL BENCH -- An instrument of the lathe-bed type used to support apparatus to determine the focal length, radius of curvature, image quality or aberrations, and similar properties of optical elements.

OPTICAL LINE OF SIGHT -- The generally curved path of visible light through the atmosphere. Often used erroneously for geometrical line of sight.

OPTICAL TURBULENCE -- Irregular and fluctuating gradients of optical refractive index in the atmosphere. Optical turbulence is caused mainly by mixing air of different temperatures, and particularly by thermal gradients which are sufficient to reverse the normal decrease in density with altitude, so that convection occurs.

OPTIMAL DAMPING -- A damping ratio slightly less than unity which limits the overshoot to a value less than the specified uncertainty of the instrument.

OR -- (See **inclusive OR; exclusive OR**.)

OR CIRCUIT -- A circuit in which the phase or polarity of the output signal results from the inclusive OR function applied to the phase or polarity of the input signals.

OR GATE (computer) -- A gate whose output is energized where any one or more of the inputs is in its prescribed state. An OR gate performs the function of the logical inclusive OR.

ORBIT -- The path which a celestial object, including artificial satellites, follows in its motions through space, relative to some selected point.

ORIGIN -- 1. A point in a system of coordinates which serves as the initial point in computing its elements or in prescribing its use. **2.** Relating to a computer, the absolute storage address of the beginning of a program or block. In relative coding, the absolute storage to which addresses in a region are referenced.

OSCILLATION OR BOUNCE INTERVAL (ballistic camera) -- In a capping shutter operation, the interval following transport phases during which the blade overtravel comes to rest. In a properly designed capping shutter, this interval may exist between clearance opening and full opening in opening cycle, and clearance closing and full closed in closing cycle.

OSCILLOGRAPH -- 1. A recording galvanometer. 2. In telemetry, a recording mirror galvanometer which converts electric signals into a record on film or sensitized paper.

OSCILLOSCOPE -- (See **scope**.)

OUTER ATMOSPHERE -- Very generally, the atmosphere at a great distance from the Earth's surface; possibly best used as an approximate synonym for "exosphere".

OUTPUT -- 1. The electrical signal from a system or device which is a function of the applied measurand or input. **2.** Relating to a computer, information transferred from internal storage to external storage or to an off-line output device.

OUTPUT IMPEDANCE -- The impedance presented by a device to a load.

OVERCAST -- 1. Descriptive of a sky cover of 95 percent or more when at least a portion of this amount is attributable to clouds or obscuring phenomena aloft; i.e., when the total sky cover is not due entirely to surface-based obscuring phenomena. In aviation weather observation, an overcast sky cover is denoted by the symbol ⊕. It may be explicitly identified as thin (predominantly transparent); otherwise, a predominantly opaque status is implicit. An opaque overcast sky cover always constitutes a ceiling. **2.** Popularly, the cloud layer that covers most or all of the sky. It generally suggests a widespread layer of clouds like those typical of a warm front.

OVERFLIGHT (safety) -- Deliberate testing of guided missiles over populated areas.

OVERFLIGHT CORRIDOR (safety) -- A missile flight corridor over population centers between the launch and impact areas.

OVERFLOW (computer) -- The generation of a quantity beyond the capacity of a register or field.

OVERFLOW, FLOATING POINT (computer) -- A condition occurring when the characteristic exceeds its maximum allowable value.

OVERLOAD (transducer) -- The maximum magnitude of measurand that can be applied to a transducer without causing a change in performance beyond specified tolerances.

OVERPUNCH (computer) -- 1. A zone punch (12, 11 or 0) in a punch card that distinguishes alphabetic and special characters from numeric characters in the Hollerith code. **2.** Also in Hollerith, a 12 punch (Y punch) or and 11 punch (X punch) over a numeric punch in a field known to he numeric; used to convey controlling information, e.g., plus or minus, add or ignore, number has/has not overflowed out of field, etc.

OVERSHOOT -- The initial transient response to a unidirectional change in input which exceeds the steady-state response.

P

PACK (computer) -- To combine two or more units of information into a single physical unit such as a machine word to conserve storage.

PANCHROMATIC -- A photographic emulsion that is visible throughout the entire visible spectrum.

PARALLAX -- The apparent change in the position of an object resulting from the change in the position from which it is viewed. Commonly encountered in photography as the difference between the image seen by the camera viewfinder and that actually taken by the lens. Parallax enters into many problems of astronomy, surveying and mapping. It is an inclusive term and, wherever clarity demands, it should be accompanied by a defining adjective. Parallax is also a basic term in photogrammetry, often qualified as "linear parallax", "stereoscopic parallax", etc.

Annual -- The difference between the direction from the earth to a star and the direction from the Sun to the same star. Also termed "heliocentric parallax". The annual parallax of a given star is equal to the angle at the star subtended by the radius of the earth's orbit. Annual parallax does not enter into any surveying problems.

Diurnal -- The difference between the direction from a point on the surface of the earth to a planet, star or other celestial object, and the direction from the center of the earth to the same object. Also known as "horizontal parallax", "secular parallax" and "geocentric parallax." Diurnal parallax at a given point on the surface of the earth changes in magnitude as the earth rotates on its axis and its magnitude is greatest when the celestial object is in the horizon of the given point. It is then equal to the angle at the object subtended by the semidiameter of the earth and is termed "horizontal parallax". The angle at a celestial object subtended by the equatorial semidiameter of the earth is termed "equatorial horizontal parallax", and is used to indicate the distance of the object from the earth.

Instrumental -- A change in the apparent position of an object with respect to the reference marks of an instrument which is due to imperfect adjustment of the instrument or to a change in the position of the observer. When a telescope is poorly focused, so that the image of the object does not lie in the plane of the reticle (cross hairs), a movement of the eye transverse to the line of collimation will cause an apparent movement of the image of the object with respect to the cross hairs. This is a usual form of instrumental parallax, and for it the term "optical parallax" is used. Parallax may also result from the

PARALLAX -- Instrumental -- (continued)

position in which an observer stands with respect to the fiducial marks on an instrument (as when reading a vernier or marking a tape end). For this type of parallax the term "personal parallax" is used.

PARALLAX DISTANCE -- The linear displacement between the origin of two lines of sight which are aligned to the same point in space.

PARALLAX ERROR -- An error in measurement between two pairs of antennas which occurs when the center of the two baselines do not coincide. This error is a function of the distance of the target from the baseline, as well as its relative direction.

PARALLEL --

Astronomic -- A line on the surface of the earth which has the same astronomic latitude at every point. Because the deflection of the vertical is not the same at all points on the earth, an astronomical parallel is an irregular line, not lying in a single plane. Also termed “astronomic equator" and "terrestrial equator".

Auxiliary standard (United States public-land surveys) -- An additional standard parallel or correction line established for control purposes where original standard parallels or correction lines were placed at intervals of 30 or 36 miles. Auxiliary standard parallels are used in the extension of old surveys and for the control of new surveys.

Geodetic -- A line on the spheroid which has the same geodetic latitude at every point. A geodetic parallel, other than the Equator, is not a geodetic (geodesic) line. In form, it is a small circle whose plane is parallel with the plane of the geodetic Equator.

Geographic -- A line on the earth having the same latitude at every point. The term is applicable alike to an astronomic parallel or to a geodetic parallel.

Standard (cartography) -- A parallel of latitude which is used as a control line in the computation of a map projection. In illustrations of map projections of the conic type, a standard parallel usually represents a line of tangency or of intersection with the surface on the spheroid. Such illustrations are not exact.

PARARESCUE TEAM -- Specially trained personnel who are able to gain access to the site of an accident by land or parachute, render medical aid and rescue survivors.

PARASITIC TRACKING SYSTEM -- In general, a system that makes use of a transmitter which has been installed in a vehicle for another purpose.

PARITY --

Telemetry -- The symmetrical property of a wave function. Parity is 1 (or even), if the wave function is unchanged by an inversion (reflection in the origin) of the coordinate system and -1 (or odd), if the wave function is changed only in sign.

Computer -- A sameness in level or count. Used in the sense of reading back a number or character identically the same as the number or character sent to the record head, etc.

PARITY BIT -- A bit added to a binary code group which is used to indicate whether or not the number of recorded 1's or 0's is even or odd.

PASS -- 1. (See **machine run**.) **2.** One maneuver by an aircraft over a range, as opposed to a flight which may consist of several maneuvers.

PASS INTERVAL (ballistic camera) -- That portion of the operation cycle of a capping shutter within which a photographic exposure may occur.

PASSIVE RANGING DOPPLER SYSTEM (PARDOP) -- A trajectory measuring system similar to DOVAP except that no transponder is used in the missile. A reflection system whereby space position is computed from several loop ranges between the transmitter, missile and receivers.

PASSIVE TRACKING SYSTEM -- In general, a system that tracks by reflected radiation from some external source or by the jet emission of the vehicle. Examples: optical systems, commercial radio or television reflection, and infrared systems.

PEAK AMPLITUDE -- The maximum deviation of a phenomenon from its average or mean position. When applied to vibration, same as single amplitude.

PEAK POWER -- The power level at the maximum of a pulse that has a well defined flat top. For other pulses the level usually is taken at the smooth peak (the maximum value of a smooth curve through the fluctuations over the top portion of the pulse.)

PEAK-TO-PEAK (transducer) -- The arithmetical (not algebraic) sum of the positive and negative peak values of an alternating quantity .

PEDESTAL, PAN (telemetry) -- An arbitrary minimum signal value assigned to provide for channel synchronization and decommutation.

PERIGEE -- The point in the orbit of a satellite nearest to the earth or other reference object.

PERIPHERAL EQUIPMENT -- (See **auxiliary equipment**.)

PERSPECTIVE CENTER -- A point through which all rays from an object to an image must pass.

PERTURBATIONS OF A SATELLITE ORBIT -- Deviations of the motion of an earth satellite from an ellipse because of noncentral forces arising from the nonsphericity of the earth, atmospheric drag, etc.

PHASE -- 1. The visible aspect of an object. In astronomy, phase is a stage in a cycle of recurring aspect caused by a systematic variation of the illumination of an object. The Moon passes through its phases, new moon to full moon and back to new moon, as its position relative to the Sun and earth changes. In surveying, phase is applied to a signal which presents areas of varying brightness to the observer; a round pole, illuminated from the side; a square pole, of which the observer sees two sides, one more strongly illuminated than the other. The error in pointing due to phase is of the same character and requires the same treatment as an error due to observing an eccentric object. Phase may be closely associated with asymmetry of object (target), but the two terms are not identical. **2.** A portion of a missile trajectory.

Launch -- A time period that begins with the instant of liftoff and ends with the burnout of the booster or last booster stage (not including orbital injection thrust stages, as for the Atlas).

Mid-course -- A time period that begins with the burnout of the booster or last booster stage (not including orbital injection thrust stages, as for the Agena) and ends with orbital injection, escape velocity or the start of the terminal/re-entry phase.

Orbital -- A time period that begins when a test vehicle first attains enough velocity to prevent a return to the Earth's surface on a ballistic trajectory. This critical velocity has also been described as the minimum velocity

PHASE -- Orbital -- (continued)

necessary for the predicted impact point to vanish. The orbital phase ends when the test vehicle velocity drops below the preceding minimums, or when the vehicle enters the terminal phase by meeting any of the phase's multiple criteria.

Post-flight -- Synonymous with the post-operation phase for launch operations. The term is not used for orbital support operations.

Post-operation -- The time after a range, or a major operation element thereof, is no longer required for direct active participation in a test.

Re-entry; terminal -- **1.** A guidance phase covering the missile's trajectory from the end of midcourse guidance to impact. **2.** For ballistic missiles, the part of the trajectory from re-entry to impact.

PHASE CENTER; CENTER OF RADIATION -- Pertains only to antennas whose radiating energy can be observed at a point within the antenna array from a distance of many wavelengths.

PHASE COMPARATOR -- (See **phase detector**.)

PHASE COMPARISON TRACKING SYSTEM -- A system which provides target trajectory information by the use of continuous wave phase comparison techniques.

PHASE DETECTOR -- A device that continuously compares the phases of two signals and provides an output proportional to their difference in phase.

PHASE DEVIATION LIMIT -- The maximum allowable amount of the peak difference between the instantaneous phase of the modulated wave and the carrier frequency.

PHASE DIFFERENCE -- The time in electrical degrees by which one wave leads or lags behind another.

PHASE LOCK -- A technique for making the phase of an oscillator signal follow exactly the phase of a reference signal. Accomplished by comparing the phases between the two signals and using the resultant difference signal to adjust the frequency of the reference oscillator.

PHASE-LOCKED LOCAL CHANNEL RATE OSCILLATOR -- A local oscillator maintained at channel switching frequency by servo control. Error voltage is derived from separated frame and/or channel synchronizing pulses when compared in frequency and phase with signals generated by local ring counterchain. The ring counterchain is triggered by the local oscillator in the absence of normal channel synchronizing pulses.

PHASE-LOCK LOOP -- An electronic servo system used either as a tracking filter or as a frequency discriminator. (See **modulation, phase**.)

PHASE MULTIPLIER -- A device that multiplies the frequency of signals used for phase comparison so that phase differences may be measured to a higher degree resolution.

PHASE SIMULATOR -- A precision test instrument which generates reference and data signals on the same frequency but precisely separated in phase. It is normally used to checkout precision phase meters.

PHASE VELOCITY, waveguide -- The velocity at which phase change is propagated through a waveguide. The rate of movement of the point of intersection between the waveform and the wall of the waveguide as the point moves down the guide. This velocity may be numerically greater than the velocity of light. A wavefront is propagated in a zigzag fashion in a waveguide, reflecting off the walls of the guide. (See **group velocity, velocity of propagation**.)

PHOTOMACROGRAPHY-- A process for making either moderately magnified or unmagnified pictures of small objects. A photomacrograph represents an enlargement of about no more than 20 diameters.

PHOTON FUNNEL -- A conical reflector used in conjunction with optical aid for photomultiplier equipment to increase sensitivity and angular field of view.

PICKET SHIP -- One of the ocean-going ships used on an overwater missile range to provide added instrumentation for tracking or receiving the missiles. The picket ship may be used to extend the length of the range.

PICO -- Prefix meaning one trillionth (1×10^{-12}=0.000000000001).

PILOT-BALLOON OBSERVATION (PIBAL) -- A method of winds-aloft observation (the determination of wind speeds and directions in the atmosphere above a station). This is done by reading the elevation and azimuth angles of a theodolite while visually tracking a pilot balloon. The approximate ascension rate of the balloon is determined by careful inflation to a given total lift. After

release from the ground, periodic readings of elevation and azimuth angles of the balloon, usually taken at 1-minute intervals, are recorded. These data are transferred to a winds-aloft plotting board, and the wind speed and direction at selectmen levels are calculated by trigonometric methods.

PIN REGISTRATION -- A method of indexing motion picture film for exposure or readout whereby a pin or pins engage a sprocket hole or holes to maintain the film in a precise position vertically and horizontally during the time of exposure or readout.

PIP -- A signal or special marker on a radar scope.

PITCH -- 1. An angular movement about the pitch axis. **2.** An angular displacement about an axis parallel to the lateral axis of in airframe.

PITCH ANGLE -- An angular displacement about the pitch axis between the roll axis and a reference plane normally defined by a line tangent to the vehicle's trajectory and a line perpendicular to the tangent line and horizontal to the Earth's surface or a similar reference surface. The pitch angle's positive direction is clockwise when viewing the vehicle in the direction of the positive pitch axis.

PITCH PLANE -- A plane normal to the pitch axis which is defined by the roll and yaw axes.

PLANAR INDICATOR -- An indicator which provides the coordinates of a missile in a given target plane with respect to a specific point on the target as the missile penetrates the target plane.

PLANE WAVE -- A wave whose equiphase surfaces form a family of parallel planes.

PLASMA -- An ionized gas having no appreciable net charge.

PLOTTING BOARD -- An output unit which plots a curve of one variable as a function of another. An analog recording device extensively used to provide a time correlated position and altitude plot on a range map. Plotting boards may record one or more variables and any combination of X-Y-Z or time.

PLUNGE -- To rotate around the horizontal axis passing through zenith or nadir; sometimes called "dump."

POINT-BASED LINEARITY -- A manner of expressing nonlinearity as deviation from a straight line which passes through a given point or points.

POINTERS -- The second-magnitude stars, Alpha and Beta, in the constellation Ursa Major (Big Dipper) which determine the line pointing to Polaris. The pointers facilitate the finding and identification of Polaris and are in the outer side of the bowl of the Big Dipper (away from the handle).

POLAR (computer) --

Bi-polar -- A signal whose logical "true" input is represented by an electrical voltage polarity opposite to that representing a logical "false" input.

Uni-polar -- A signal whose true and false inputs are represented by the same electrical voltage polarity.

Polar distance -- **1.** An angle which is the complement of the declination (codeclination) or 90° minus the declination. **2.** Polar distance forms one side (celestial body to pole) of the astronomical triangle and is opposite the zenith.

Polaris -- The second-magnitude star, Alpha, in the constellation Ursa Minor (Little Dipper). Also known as the Pole Star or North Star because of its proximity to the North Pole of the celestial sphere. Polaris is well situated for determinations of astronomical azimuth and for the determination of the direction of the celestial meridian. It is located at the extreme outer end of the handle of the Little Dipper. (See **pointers**.)

POLARIZATION -- The behavior of the electric vector in a fixed plane normal to the direction of propagation as an electromagnetic wave moves through a medium.

Circular -- The polarization of a wave radiated by a constant electrical vector rotating in a plane so as to describe a circle.

Cross -- The component of the electric field vector normal to the desired polarization component.

Elliptical -- The polarization of a wave radiated by a constant electrical vector rotating in a plane so as to describe an ellipse.

Linear -- The polarization of a wave radiated by an electric vector that does not rotate but alternates so as to describe a line. Normally the vector is oriented either horizontally or vertically.

Phi (ϕ) -- The state of the wave in which the E (electric) vector is tangential to the lines of latitude of some given spherical frame of reference.

POLARIZATION -- (continued)

Theta (θ) -- The state of the wave in which the E (electric) vector is tangential to the meridian lines of some given spherical frame of reference.

POSITION -- 1. A point with respect to a reference system; a point on the surface of the earth; the coordinates which define the location of a point on the geoid or spheroid. **2.** A prescribed setting of the horizontal circle of a direction theodolite used for observing a series of stations from an initial station and for indicating the position of the horizontal circle. For example: in first-order triangulation using a Wild T-3 direction theodolite, the circle would be set to read 0°00' 10 units for the position first described and ll°OO' 25 units for the second position.

Adjusted -- An adjusted value of the coordinate position of a point on the earth. In the adjustment of a horizontal control survey, discrepancies arising from errors in the observational data are removed and position data of the survey stations are correlated and coordinated on an adopted reference system (geodetic datum or plane-coordinate system). The positions thus obtained are called adjusted positions, and when used as control for other work are referred to as fixed positions. In the adjustments of a vertical control survey, the values obtained are adjusted elevations, called "fixed elevations" when used to control other work.

Field -- A position computed while field work is in progress to determine the acceptability of the observations or to provide a preliminary position for other purposes.

Fixed -- (See **position, adjusted**.)

Geodetic -- A position of a point on the surface of the earth expressed in terms of geodetic latitude and geodetic longitude. A geodetic position implies an adopted geodetic datum. In a complete record of a geodetic position, the datum must be stated.

Geographic -- The position on the surface of the earth expressed in terms of latitude and longitude, either geodetic or astronomic. Sometimes used to denote an area. The United States Coast and Geodetic Survey uses this term to denote positions on a geographic datum.

POSITION IDENTIFIER (telemetry) -- An element used to reference or make detectable a particular code digit or class of code digits.

POSITION-VELOCITY-TIME (PVT) MESSAGE -- (See **vector message**.)

POST-CONVERSION BANDWIDTH -- In a telemetry receiver, the bandwidth

presented to the detector.

POWER LEVEL CONDUCTED -- RF power output of a transmitter as measured in the transmission line.

POWER PROGRAMMER -- A device for controlling the output power of a radar automatically as a function of target range.

PRECESSION OF THE EQUINOXES -- A slow western movement of the equinoxes (Those times when the Sun crosses the Equator). This amounts to about 50" a year, and causes the difference in length between the sidereal and tropical years.

PRECISION -- A measure of the repeatability with which instrumentation can reproduce repeated measurements of the same quantity. Precision can be expressed in terms of the variation of instrument measurement errors; a large variation signifying lack of precision and a small variation signifying high precision. High precision does not necessarily imply accuracy. This term applies to the system(s) for acquiring and processing the information, not the media on which it is displayed (such as film or paper).

PRECISION CRITERION -- The particular type or value of variance or standard deviation which applies to or characterizes a particular stage of the measurement or data reduction process. From a user standpoint, characterizes a particular aspect of the missile-performance variable, i.e., instantaneous, intermittent, continuous.

PREDICTED IMPACT (safety) -- The point where the missile will impact as calculated from the equations of motion at any time after the last external force has been removed.

PRE-EMPHASIS -- The intentional alteration of the normal signal by emphasizing one range of frequencies with respect to another. Usually applies to telemetering subcarrier frequencies prior to transmission to improve the signal-to-noise ratio.

PRELAUNCH AREA (safety) -- Land area surrounding the launch site within which significant danger to personnel would exist if the missile exploded on the launch pad.

PRESSURE ALTITUDE -- The altitude at which the measured pressure would exist in a standard atmosphere.

PRESSURE ALTITUDE, STANDARD -- The altitude corresponding to a given pressure in a standard atmosphere.

PRESSURE TENDENCY; BAROMETRIC TENDENCY -- The character and amount of atmospheric pressure change for a 3-hour or other specified period ending at the time of observation. The characteristic of the change is determined by the appearance of the barogram and the direction of change, i.e., higher or lower, from the initial value. These are combined into a single code digit. The amount of change is expressed in tenths of millibars. This information is reported only by stations equipped with a microbarograph.

PREVAILING WIND-- The wind direction most frequently observed during a given period. The periods most frequently used are the observational day, month, season, and year. Methods of determination vary from a simple count of periodic observations to the computation of a wind rose.

PRIME CHANNELS (telemetry) -- The channels which are sequentially sampled by a system's basic commutator.

PRIME FRAME (telemetry) -- A group of words resulting from a complete sampling of the prime channel.

PRIME VERTICAL -- A vertical circle perpendicular to the plane of the celestial meridian. The plane of the prime vertical cuts the horizon in the east and west points.

PRINCIPLE OF EXCLUSION (safety) -- A flight safety technique which makes it possible to reliably predict an impact and thereby avoid sensitive areas.

PROBE (geophysics) -- A device used to make a sounding.

PROBLEM-ORIENTED LANGUAGE (computer) -- A source language geared to the description of a particular class of problems.

PROCESS (computer) -- A generic term which may denote compute, assemble, compile, interpret, generate, etc.

PROFILE (meteorology) -- A graph of the value of a scalar quantity versus a horizontal, vertical or time scale; usually refers to a vertical representation.

PROGNOSTIC CHART -- A chart showing, principally, the expected pressure or height pattern of a given synoptic chart at a specified future time. Usually positions of fronts are also included and the forecast of other meteorological elements superimposed.

PROGRAM -- 1. The projection of the horizontal component of missile movement in the vertical plane containing the flight azimuth. **2.** A plan for the solution of a problem. **3.** The total set of instructions introduced into a computer to guide its logic and to sequence in its operations for the solution of a particular problem. Routines and subroutines are parts of a computer program. **4.** To code computer routines and subroutines.

Pitch -- A planned movement about a vehicle's pitch axis.

Roll -- A planned movement about a vehicle's roll axis.

Vehicle -- The pre-established flight events to be followed by a vehicle. The program commands all critical functions required for the vehicle to accomplish its objective.

Yaw -- A planned movement about a vehicle's yaw axis.

PROGRAMMED CHECK (computer) -- A method of determining the correctness of a program by building a system into the program for checking during the trial running of the problem.

PROGRAMMING (computer) -- The act of reducing the plan for the solution of a problem to machine-sensible instructions. (See **coding**.)

PROOF PRESSURE (transducer) -- The maximum pressure which may be applied to the sensing element of a transducer without changing the transducer performance beyond specified tolerances.

PROPAGATION -- The travel of a form of wave energy (light, sound, radio) through space or along a path.

Diffraction -- Propagation around objects or over the horizon. Diffraction is due to the fact that, from every point in a wavefront, a spherical front is generated which falls off in intensity away from the forward direction. A continuous series of such actions carries radiation around objects or around the curvature of the earth, but with rapidly diminishing intensity.

PROPAGATION ERROR -- For ranging systems, the algebraic sum of propagation velocity error and curved-path error. Except at long ranges and low angles, the curved-path component of propagation error is generally negligible.

PROPAGATION VELOCITY -- The velocity at which a surface line or point of constant phase propagates; phase velocity. Unless qualified, the phase velocity of an unmodulated electromagnetic wave through a nonbounded medium.

PROPAGATION-VELOCITY ERROR -- The difference between the effective value of propagation velocity over a ray path and the assumed value. (See **effective propagation velocity**.)

PROPORTIONAL CONTROL -- A system where the output is in a predetermined ratio to its input.

PROPORTIONAL LINEARITY -- A manner of expressing nonlinearity as deviation from a straight line in terms of given percentage of the transducer output at the stimulus point under consideration, i e. , as a given percentage of the reading.

PSEUDOCODE (computer) -- An arbitrary system of symbols for an operation, operator, operand, etc.

PULSE CODE -- A pulse or series of pulses which *may* be used to convey information by means of a waveform, pulse width, pulse number or pulse sequence.

PULSE RECORDING, MAGNETIC TAPE -- A method of recording Pulse Duration Modulation (PDM) telemetry data in which the signal delivered to the recording head is the differential of the input signal.

PULSE REPETITION FREQUENCY (PRF) -- The rate at which pulses or pulse groups are transmitted from a radar set; usually given in hertz or pulses per second.

PULSE SAMPLE-AND-HOLD CIRCUIT -- A circuit which holds the final amplitude of an integrated pulse until the final amplitude of the succeeding integrated pulse is reached. A less desirable sample-and-hold circuit resets to a fixed level after each hold period before integrating a succeeding pulse.

PULSE-TIME MODULATED RADIOSONDE -- A radiosonde which transmits the indications of the meteorological sensing elements in the form of pulses spaced in time. The meteorological data are evaluated from the intervals between the pulses. Also known as "time interval radiosonde".

PULSE WIDTH -- The time interval during which a pulse exceeds a reference level (the reference level is generally taken as the half-power points).

PYROMETRIC PHOTOGRAPHY -- The derivation of flame temperature measurements by means of comparative photography using a calibrated light source.

Q

QUAD -- A structural unit employed in a cable consisting of four separately insulated conductors twisted together. Two twisted pairs may also be used.

QUADRATURE -- The phase relationship between two periodic quantities of the same period when the phase difference between them is one fourth of a period.

QUADRATURE COMPONENT -- A reactive component of a current or voltage due to the inductive or capacitive reactance in a circuit.

QUALITY (optical) -- 1. The figure of merit applied to an optical system; qualitatively expressed in resolving power and aberration limits. **2.** The figure of merit applied to an optical element; qualitatively expressed in constancy of refractive index, lack of stria and low bubble content.

QUANTIZATION -- The process of converting from continuous values of information to a finite number of discrete values.

QUASI-ACTIVE TRACKING SYSTEM -- In general, a system which modulates its interrogating beam to track signals transferred from the beam of a distant transmitter using an antenna array on the vehicle. Such systems are being developed for satellites.

QUIETING -- The decrease in noise voltage at the output of an FM receiver in the presence of an unmodulated carrier.

R

RABBIT -- Interference on a video display resulting from two or more unsynchronized radars.

RADAR -- Acronym for radio detection and ranging. A radio detecting device that emits and focuses a powerful scanning beam of ultra high frequency waves and establishes through reception and timing of reflected waves the distance, altitude and direction of motion of any object in the path of the beam. Pulse and continuous wave radars are the two most common types.

RADAR BEACON (RACON) -- A transponder specifically designed for a pulse radar tracking aid. (See **beacon**.)

RADAR CROSS SECTION -- A measure of the effective size of a radar target. An area which, when normal to the radar beam at the target, reflects the same power.

RADAR PHASING -- A method of radar operation whereby beacon sharing may be successfully accomplished.

RADAR RANGE -- The time between emission of a pulse from the transmitter and receipt of the corresponding echo multiplied by half the effective velocity of propagation.

RADARSONDE, RADAR WIND SYSTEM -- A rawin system which uses radar techniques to determine the range, elevation and azimuth of a free-floating target so that wind data may be obtained.

RADIAL VELOCITY -- The component of the velocity vector of a moving target that is directed away from or toward the ground station.

RADIATION HAZARDS (RADHAZ) -- Those electromagnetic radiations which are a source of direct danger to the human body or those that could possibly detonate or ignite explosives, flammable gases or vapors, and dust or easily ignitable particles or fibers.

RADIO CHANNEL -- A frequency band comprised of the emission-bandwidth, the interference guard bands and the frequency tolerance.

RADIO FREQUENCY (RF) -- (See **electromagnetic spectrum**.)

RADIO FREQUENCY ALLOCATION TO EQUIPMENT -- The formal approval of the electromagnetic characteristics of spectrum dependent material.

RADIO FREQUENCY MANAGEMENT AND ENGINEERING -- The function whereby: **1.** requirements for use of the radio frequency spectrum are satisfied and **2.** control of the use of the spectrum is exercised.

RADIO HORIZON -- The locus of points at which direct rays from a transmitter become tangential to the Earth's surface.

RADIOMETER -- An instrument which measures radiant energy. The Dines radiometer is an ether differential thermometer with blackened bulbs. One of the bulbs is exposed to the unknown radiation and the other to a blackbody source whose temperature can be varied. Equality of radiation is indicated by the balance of the differential thermometer.

RADIO METEOROLOGY -- That branch of meteorology which embraces the propagation of radio energy through the atmosphere and the use of radio and radar equipment.

RADIO SERVICE -- (See **telecommunications service**.)

RADIOSONDE -- A balloon-borne instrument which simultaneously measures and transmits meteorological data. The instrument consists of transducers for the measurement of pressure, temperature and humidity; a modulator for the conversion of the output of the transducers to a quantity which controls a property of the radio frequency signal; a selector switch which determines the sequence in which the parameters are to be transmitted; and a transmitter which generates the radio-frequency carrier.

RADIOSONDE COMMUTATOR -- That component of a radiosonde consisting of a series of alternate electrically conducting and insulating strips. As these are scanned by a contact, the radiosonde transmits temperature and humidity signals alternately. The contact may be a baroswitch as in the Diamond-Hinman radiosonde, or a motor-driven device.

RADIOSONDE MODULATOR -- That part of an audio-modulated radiosonde consisting of a baroswitch, sensing elements, reference elements, and a relay.

RADIOSONDE OBSERVATION (RAOB) -- An evaluation (temperature, relative humidity and pressure aloft) of radio signals received from a balloon-borne radiosonde. From these data, the height of each mandatory and significant pressure level of the observation is computed.

RADIOSONDE RECORDER -- An instrument located at the surface observing station which is used to record the data presented by a radiosonde aloft.

RADIOSONDE TRANSMITTER -- The component of the radiosonde which includes the modulating blocking oscillator and the radio-frequency carrier oscillator.

RADIO SPECTRUM -- (See **electromagnetic spectrum**.)

RADIO WAVES -- Electromagnetic waves of frequencies lower than 3,000 GHz propagated in space without artificial guide. Originally called "Hertizian waves".

RADIOWAVE PROPAGATION -- The transfer of energy by electromagnetic radiation at radio frequencies (IEEE Std 100-1972).

RANDOM ACCESS STORAGE (computer) -- 1. A storage device in which the time required to obtain information is statistically independent of the location of the information most recently obtained. **2.** A type of storage device in which access can be made directly to any storage location regardless of its position.

RANDOM NUMBER -- A set of digits sequenced so that each successive digit is equally likely to be any of N digits to the base N of the number.

RANDOM VIBRATION -- A nonperiodic vibration, described only in statistical terms. Most commonly taken to mean vibration characterized by amplitude distribution which essentially follows the normal error curve (Gaussian distribution).

RANGE AREA -- The designated surface area and airspace over and through which a particular missile flight test will be conducted.

RANGE ERROR -- (See **propagation error**.)

RANGE JITTER -- Rapid intermittent changes in the range of the beacon reply presentation as observed by the radar receiver.

RANGE-ONLY MEASUREMENT OF TRAJECTORY AND RECORDING (ROMOTAR) -- A nonambiguous spherical and elliptical, long baseline, range-only system using phase comparison techniques with range-modulation frequencies. The system consists of three or more receivers which track a transponder interrogated by a single transmitter. The reference signals from the ground transmitter are also received by the ground receivers. In addition, simultaneous range measurements are made by the ground receivers and correlated with base timing from which space position can be computed by triangulation.

RANGE RATE -- The rate at which the distance from the measuring equipment to the signal source being tracked is changed with respect to time. (See **radial velocity**.)

RANGE SPACE (safety) -- That portion of the test range which is used to conduct an operation. Since the range space will vary according to the requirements and characteristics of each test vehicle, it must be specifically defined for each operation.

RANGE SURVEILLANCE (safety) -- Visual and/or radar surveillance of a range from the surface or from the air prior to a mission to ensure that the danger area is clear of personnel, vehicles, nonmission aircraft and surface vessels. Although visual methods are preferred for water surface clearance, suitable airborne or ship radars may be used to perform this function when weather conditions or darkness prevent using visual methods.

RANGE TARGET -- A reflective target at a known range from a radar antenna. Used for radar range system alignment.

RANGING CRYSTAL (radar) -- The crystal in a range unit that determines the primary range timing frequency.

RATED RANGE -- The range within which a device should be operated to maintain the performance characteristics specified by its manufacturer.

RATIO CALIBRATION -- A method for calibrating transducers in which the value of the measurand is expressed in terms of decimal fractions representing the ratio of output resistance to total resistance.

RAT RACE -- A magic tee modification for the acceptance of higher power. A circular loop of coaxial line closed upon itself and having four branching connections.

RAYDIST-- A system using continuous wave transmission to provide hyperbolic lines of position by means of RF phase comparison techniques. The system is used for surveying or ship positioning in a two-dimensional array. Similar to LORAC in principle, the RAYDIST frequency band is 1.7 to 2.5 MHz.

RAWIN -- A method of winds-aloft observation (the determination of wind speeds and directions in the atmosphere above a station) accomplished by tracking a balloon-borne radar target, responder or radiosonde transmitter with either radar or a radio direction finder. With a radio direction finder, the height is normally supplied by other means by concurrent radiosonde observation. With

radar, if height data are not otherwise supplied, the slant range must be recorded in addition to the angles of elevation and azimuth.

RAWINSONDE -- A balloon-borne radiosonde which is tracked by a radar or radio direction finder to monitor windspeed and direction, temperature, pressure and humidity aloft. When radar is used for tracking, a radar target is also attached to the balloon. The result is a radiosonde observation combined with a type of rawin observation. Height data pertaining to significant levels aloft are computed from the radiosonde data, while wind data are derived by trigonometric computations.

REACTIVE BALANCE -- The capacitive or inductive balance which is often required to null the output of certain transducers or systems when the excitation and/or output is given in terms of alternating currents.

READER (computer) -- A device which converts information in one form of storage to information in another.

REAL-TIME DATA -- Data presented in usable form at essentially the same time the event occurs. The delay in presenting the data must be small enough to allow a corrective action to be taken if required.

REAL-TIME OPERATION -- The performance of a computation during the actual time that the related physical process transpires in order that the results of the computations are useful in guiding the physical process.

RECORD (computer) -- 1. A group of related facts or fields of information treated as a unit. **2.** A listing of information, usually in printed or printable form. **3.** One output of a compiler consisting of a list of the operations and their positions in the final specific routine and containing information describing the segmentation and storage allocation of the routine. **4.** To copy or set down information in reusable form for future reference; to make a transcription of data by a systematic alteration of the condition, property or configuration of a physical medium, e.g., placing information on magnetic tape or a drum by means of magnetized spots.

RECORD (magnetic tape) -- The process by which an electromagnetic transducer (record head) and associated electronic circuitry convert electrical data to a magnetic flux pattern on a magnetic tape.

RECORD GAP (computer) -- A blank space between records on a tape.

RECORD HEAD -- An electromagnetic transducer used during the recording process for inducing magnetic patterns into the magnetic tape.

RECORDING --

Predetection -- Recording the intermediate frequency modulated signal, containing data that has been transmitted over a radio link, on magnetic tape without demodulating the signal.

Postdetection -- Recording the data signals after the signal has been detected or demodulated.

Saturation -- A magnetic tape recording technique for binary data or single-channel FM in which sufficient record current is passed through the record head to saturate the magnetic tape, usually without additional ac bias.

RECOVERY -- The act of retrieving that portion of a launched missile or satellite which survived re-entry.

RECOVERY AREA (safety) -- The area in the vicinity of a landing strip where significant danger to people would exist if a recoverable test vehicle malfunctioned during the final recovery phase. (Not applicable to conventional nose cone operations.)

RECOVERY TIME -- The time interval after which a device again performs within its specified tolerance.

REDUCTION -- 1. In general, the transformation of data from a raw form to some usable form. **2.** Often refers to the conversion of the observed value of an element to the value which it theoretically would have at some selected or standard level.

REDUNDANCY -- A repeated or extra item of information used in determining the accuracy of moved digits or words in a computer. For instance, an extra bit may be added to the bits which comprise a character in the computer to always have a representation of an odd (or even) number of bits. After moving each character, an automatic test of this redundant bit (parity check) will help establish the accuracy of the moved character.

REDUNDANCY CHECK (computer) -- A method for detecting malfunctions and mistakes which uses extra digits in machine words instead of complete duplication. (See **parity check**.)

REFERENCE MARK -- A permanent supplementary mark placed close to a survey station from which it is accurately measured in distance and azimuth. The correlation between a survey station and its reference marks should be of sufficient precision and accuracy to permit re-establishment of the station should

its marks be destroyed, or so the reference mark can be used in place of the survey station in the extension of surveys. Reference marks are used to define positions of boundary corners which are situated in water or in other areas where permanent marks cannot be placed exactly at the corners.

REFERENCE MARKER (telemetry) -- Two consecutive position identifiers. The on-time point is the leading edge of the second position identifier. The time of occurrence of the on-time point is defined by the code word which follows it.

REFERENCE PRESSURE (transducer) -- The pressure reference to which a differential pressure transducer measures pressure.

REFERENCE SIGNAL -- The signal against which data carrying signals are compared to measure differences in time, phase, frequency, etc.

REFLECTION COEFFICIENT -- The efficiency of a reflecting surface. The ratio of the total reflected energy to the incident energy impinging upon a reflecting surface.

REFLECTION DOPPLER -- A system which uses a Doppler frequency shift to measure the position and velocity of an object not carrying a transponder.

REFLECTIVE TRACKING SYSTEM -- In general, one which tracks by reflecting its transmitted power off the vehicle of interest. Examples include radar skin track and searchlight systems.

REFLECTIVITY --

Bistatic-- The characteristic of a reflector which reflects energy along a line different from, or in addition to, that of the incident ray; for example: any reflector that scatters the incident energy.

Monostatic -- The characteristic of a reflector which reflects energy only along the line of the incident ray; for example: a corner reflector.

Sense-reversing -- The characteristic of a reflector that reverses the sense of a circularly polarized incident ray. A perfect corner reflector is invisible to a circularly polarized radar because it reverses the sense.

REFLECTOR, CORNER --

Geodetic -- A special type of target reflector used in optics to obtain the high gain of the plate so that a strong reflection is assured in almost any direction. If a beam is directed into a corner reflector, triple reflections occur and the beam is sent in the direction from which it came. Used principally with a geodimeter.

Radar -- A reflector designed to give maximum energy return at a given frequency. This is accomplished by making the dimensions of the reflector an odd multiple of the radar energy wavelength.

REFRACTION -- A change in the direction of the propagation of a wavefront due to its passing obliquely from one medium to another where its speed is different. Refraction may occur in a single medium of varying characteristics.

REFRACTION ERROR -- (See **astronomical refraction error, terrestrial refraction error, curved-path error**.)

REFRACTIVE INDEX -- 1. The light bending power of an optical material (glass, plastic, etc.); used to classify optical glass types. The refractive index is determined by the equation:

$$n = \frac{\sin i}{\sin r} \quad (\textit{Snell's law})$$

where n=refractive index, i=angle of incidence, and r=angle of refraction. **2.** The ratio of the free-space velocity 'c' to the phase velocity of electromagnetic radiation in a given medium.

REFRACTIVITY -- The algebraic difference between a refractive index value and unity. Refractivity may be more conveniently expressed in N-units: $N=(n-1)10^6$. The deviation of radio refractivity at any altitude from the usual standard profile may be shown as a variation about a vertical axis (at the ground-level value of refractivity) by using B-units: B=N + 0.012h, where h is altitude above ground level in feet. The deviation of refractivity at any altitude from the gradient at which the refractive curvature of a tangential ray will match the curvature of the earth may be shown as a variation about a vertical axis (at the ground-level value of refractivity) by using M-units: m=N + 0.048h, where 0.048h is 10^2h divided by the radius of the earth in feet.

REGISTER (computer) -- A specific unit for storing a group of bits or characters.

RELATIVE ADDRESS (computer) -- An address of a machine instruction which is referenced to an origin; e.g., R+15 is a specific address relative to R where R is the origin.

RELATIVE CODING (computer) -- Coding using relative addresses.

RELIABILITY -- Indicates trustworthiness and dependability, and frequently used to imply a reliability factor or coefficient.

Equipment -- The probability that the item will perform its desired function for the expected length of time in the regional environment.

Operation -- A success rate based on either a predicted probability or a past record.

REMOTE TERMINAL -- A user's output device, e.g., cathode ray tube, teletype, television. Users must normally provide electronic characteristics of their system for the range to plan a compatible output. Considerations necessary when requesting data of this nature include:

- Communication linkages available (microwave, phone, teletype) and security classification.
- Interface equipment available/needed.
- Information rate, identification codes, category of data (metric, telemetry, etc.) and parameters required.
- Time intervals and constraints.

REPEATABILITY -- 1. The maximum deviation from the average of corresponding data points taken from repeated tests under static and identical conditions for any one stimulus value. Often the number of repeated tests is specifically limited to a convenient number of runs. The number of stimulus points may include the full range of the instrument or may be limited to a measurand interval within the range of the device. The term is often extended to mean the difference in output for any given identically repeated stimulus with no change in the remaining test conditions. **2.** (transducer) The maximum difference in output readings when the same measurand value is applied repeatedly under the same conditions and in the same direction.

REPEATER STATION -- A station at which a repeater device for building up and equalizing the strength of a telephone or telegraph signal in a long line is located; an intermediate station in a microwave system which is arranged to receive a signal from an adjacent station and amplify and retransmit it to another adjacent station.

REPRODUCE HEAD -- An electromagnetic transducer which converts the remnant flux patterns in a magnetic tape into electrical signals during the reproduce or playback process.

REPRODUCE; PLAYBACK (magnetic tape) -- The process by which an electromagnetic transducer (reproduce head) and associated electronic circuitry convert the magnetic flux pattern on a magnetic tape to an electrical signal containing the recorded information.

REPRODUCER (computer) -- A device which can duplicate all or part of the information contained on one card onto another card.

RERUN (computer) -- A repeat of a machine run usually due to correction, an interrupt or a false start.

RESEARCH ROCKET; SOUNDING ROCKET -- A vehicle used to determine the validity or reliability of data and equipment being developed; a rocket vehicle designed for or adapted to high-altitude research.

RESECTION -- The determination of the horizontal position of a survey station by observed directions from the station to points of known position. The most common problem in resectioning is determining a point of observation. This is done by measuring two angles between three fixed points; called the three-point problem, it is solved by computation in triangulation, by mechanical means with a three-arm protractor, or graphically on a plane table survey. Its solution gives what is often termed a "fix": a position for the point of observation. As employed in photogrammetry, resection refers to position determination from measurements on photographs.

RESET -- To return a device to zero or to an initial or arbitrarily selected condition.

RESIDUAL -- The difference between any value and some estimate of the means of such values, e.g., residuals from a curve of regression. The complement of a set is called a residual set.

RESOLUTION -- 1. The degree to which small increments of the physical or electrical quantity, property or condition which is measured can be discriminated in terms of instrument output. **2.** A measure of the resolving power of a measuring instrument. The measure of resolution is the smallest change in the observed phenomenon that the instrument can measure, not necessarily the smallest change that can be detected. This measure usually is the least count of the data output device. Resolutions cannot be smaller than the least count, but the least count can be smaller than the resolution. This term applies to the

RESOLUTION -- (continued)

system(s) for acquiring and processing the information, not the media on which it is displayed (such as film or paper).

RESOLVER -- A device which separates or breaks up a quantity into constituent parts or elements.

RESONANCE (transducer) -- A system is in resonance when oscillations are produced in one part of a system by the oscillations present in another part of the system.

RESPONSE CURVE -- A plot of stimulus versus output. Also, a plot of output versus frequency for a specific device.

RESPONSE TIME -- The time required for the pointer, or indicating means, to reach its new position after the measurand has been abruptly changed.

RESULTANT ACCELERATION -- The vector sum of the component accelerations.

RESULTANT VELOCITY -- The vector sum of the component velocities.

RESULTANT WIND (meteorology) -- The vectorial average of all wind directions and speeds for a given level, at a given place, for a certain period. It is obtained by resolving each wind observation into components from north and east, summing over the given period, obtaining the averages, and reconverting the average components into a single vector.

RETICLE -- A network of fine lines, wires, or the like placed in the focus of the objective of a telescope or other optical instrument.

RETICULATION -- The wrinkling or cracking of the emulsion surface of a film due to temperature changes during processing.

REVOLUTION -- 1. (astronomy) The turning of a body about an exterior point or axis. (See **rotation**.) **2. (mathematics)** The turning of a geometrical figure about an axis. It is said that the earth rotates on its axis and revolves around the Sun; however, in usage, such clear distinction between rotate and revolve is not always made with complete consistency. For example: in geodetic surveying, a spheroid adopted to represent the earth is termed an "ellipsoid of revolution" although, according to exact terminology, it is an ellipsoid developed by the rotation of an ellipse around its minor axis. It may be desirable to disregard

custom and speak of such a figure as an ellipsoid rotation. The expression "spheroid of revolution" is of such general use that it is accepted.

RHUMB LINE -- A line which crosses successive meridians at a constant angle. The Mercator is the only map projection on which a rhumb line is represented by a straight line. Other names for rhumb line are: "loxodrome," "loxodromic curve," "equiangular spiral," and "Mercator track."

RIBBON FRAME CAMERA -- A camera whose frame has a width-to-length ratio greater than 3 to 1.

RIDGE; WEDGE (meteorology) -- An elongated area of relatively high atmospheric pressure, almost always associated with and most clearly identified as an area of maximum anticyclonic curvature of windflow. The locus of this maximum curvature is called the "ridge line". Sometimes, particularly in discussion of atmospheric waves embedded in the westerlies, a ridge line is considered to be a line drawn through all points at which the anticyclonically curved isobars or contour lines are tangent to a latitudecircle. The term is most commonly used to distinguish a ridge from the close circulation of a high or anticyclone. A ridge may include a high. An upper-air ridge may be associated with a surface high. A high may have one or more distinct ridges radiating from its center. The opposite of a ridge is a trough.

RIGHT ASCENSION -- The angle between the plane of the hour circle passing through a celestial body and the plane of the hour circle passing through the vernal equinox. Right ascension may be measured by the angle at the celestial pole between the tangents to the hour circles of the body and of the vernal equinox or by the arc of the Equator intercepted by those hour circles. Right ascension is measured eastward from the vernal equinox through 24 hours (360°). It corresponds to longitude on the earth and, with declination, forms a pair of coordinates which defines the position of a body on the celestial sphere.

RIGHT-HAND (clockwise) POLARIZED WAVE -- An elliptically polarized transverse electromagnetic wave in which the rotation of the electric field vector is clockwise for an observer looking in the direction of propagation. (See **polarization sense**.)

RING-AROUND -- Self-interrogation of a beacon due to insufficient isolation between receiver and transmitter; i.e., the beacon transmitter pulse passes through the receiver and retriggers the transmitter.

RISE TIME -- 1. Time required for the leading edge of a square wave input to rise to some percentage of its final value on the indicator. (See **time constant**.) **2.** The length of time for the output of a transducer to-rise from a small percentage of its final value to a large specified percentage of its final value.

Minimum -- The rise time calculated from the equation:

$$T = \frac{0.35}{BW}$$

where BW=subcarrier channel bandwidth based on a deviation ratio of 1.

Nominal -- The rise time calculated from the equation:

$$T = \frac{0.35}{BW}$$

where BW=subcarrier channel bandwidth based on a deviation ratio of 5.

ROLL -- 1. An angular movement about the roll axis. **2.** When applied to a missile, an angular displacement about an axis parallel to the longitudinal axis of the airframe.

ROLL ANGLE -- An angular displacement about the roll axis between the pitch axis and a reference plane normally defined by a line tangent to the vehicle's trajectory and a line perpendicular to this tangent line and horizontal with or parallel to the Earth's surface or a similar reference surface. Its positive direction is clockwise when viewing the vehicle from the rear in the direction of the positive roll axis. The roll angle is sometimes called the "angle of bank."

ROLLER PATH -- 1. The locus of the centerlines or centers of a bearing with respect to mount reference. **2.** The path on the surface of a bearing along which the rollers or balls move.

ROLL PLANE -- A plane normal to the roll axis and defined by the yaw and pitch axes.

ROOT MEAN SQUARE (rms) -- A measure of variability or scatter. It is the square root of the average (mean) of the squares of the observations.

ROPE CHAFF -- Chaff that contains one or more rope elements.

ROTARY JOINT -- A waveguide or coaxial device which is inserted between the two waveguide or coaxial elements so that relative rotation of the elements has no effect on the flow of energy along the waveguide or coaxial lines.

ROTATION --

Astronomy -- The turning of a body about a self-contained axis. (See **revolution**.)

Surveying -- The turning of an instrument or part of an instrument about an axis.

ROUND -- To adjust the least significant digits retained in truncation to partially reflect the dropped portion; e.g., when rounded to three digits, the decimal number 2.7561 becomes 2.76.

ROUTINE (computer) -- A sequence of machine instructions which carry out a well-defined function.

ROW -- The horizontal vector of a matrix. (See **card row**.)

R-T UNIT -- The receiver-transmitter portion of a radar beacon system.

RULINGS -- The fine scribings or markings on the reticle or glass circular scales.

S

SAFETY PLUG (safety) -- A device to break both sides of the firing line and ground the missile side of the firing line.

SAFING AND ARMING DEVICE (safety) -- A device which protects a destruct system from accidental premature operation.

SCALAR ACCELERATION -- The square root of the sum of the squares of three orthogonal components of the acceleration. The magnitude only of an acceleration vector.

SCALAR VELOCITY -- The square root of the sum of the squares of three orthogonal components of the velocity. The magnitude of the velocity vector.

SCALE -- Altering the units in which variables are expressed to bring all quantities within a given range.

SCALE DIVIDER -- (See **vernier, scale**.)

SCALE FACTOR -- 1. A multiplier used to proportion quantities to a desired magnitude. **2.** A value used to change a quantity from one notation to another. **3.** The ratio of full-scale output to the value of the measurand at full range.

SCATTER -- Diffusion of a wavefront due to encounters with particles with an irregular surface or with randomly distributed gradients of refractive index. Particles scatter can involve resonance with electric fields, reflection or refraction. Reflection from a granular surface commonly involves particle refraction. Randomly distributed gradients of refractive index in the atmosphere are due to randomly distributed gradients of water vapor content or to thermal turbulence.

SCINTILLATION -- Rapid intermittence or brief duration of intensity of radiation.

SCOPE -- A colloquialism which refers to cathode-ray oscilloscopes.

A -- A radar indicator used for observing radar signals and various circuit waveforms in a radar set. The laboratory analogue of the A-scope is commonly referred to as the synchroscope.

B -- A radar indicator which displays a rectangular plot of range versus azimuth with range usually presented in the vertical direction and azimuth in the horizontal direction.

SCOPE -- (continued)

C -- A rectangular radar display on which targets appear as bright spots with azimuth indicated by the horizontal coordinate and elevation angle by the vertical coordinate.

D -- A radar display similar to that of a C-scope, except that the blips extend vertically to give a rough estimate of the distance.

E -- A radar display on which a target appears as a centralized blip when the antenna is positioned on the target (variation of C-scope).

F -- A radar display on which a target appears as a laterally centered blip when the radar antenna is aimed at the target and wings appear to grow on the blip as the distance to the target is diminished.

G -- A B-scope which has been modified to include an indication of the angle of elevation.

H -- A radar display on which a target appears as a complete circle when the radar antenna is correctly pointed at the target. The radius of the circle is proportional to the target distance.

I -- A modified A-scope radar display on which the time base is a circle. The target signal appears as a radial deflection from the time base.

J -- A modified A-scope radar display on which a target appears as a pair of vertical deflections or blips instead of a single deflection.

K -- A radar scope on which the target appears as two horizontal blips, one extending to the right and one to the left from a central vertical time base.

L -- An A-scope radar display on which target distance is determined by moving an adjustable pedestal signal along the baseline until it coincides with the horizontal position of the target signal deflection.

SCORER -- A device which provides an indication of the missile penetration of a sphere of predetermined radius about a given point on the target. "Go" or "no go" is often used to indicate a hit or miss.

Cooperative -- A scorer which requires a modification or augmentation of the munition scored. This may take many forms, such as installation of a transmitter, a flare, radioactivity, etc.

SCORER -- (continued)

Cooperative missile -- A system which is located in the target but uses existing missile equipment.

Cooperative missile target -- A system in which equipment is located in both missile and target.

Cooperative target -- A system which is located in the missile but uses existing target equipment.

Firing error indicator -- A system which provides sufficient data to determine fire control system error. The data includes information regarding miss, fire control system parameters, and intermediate trajectory required to determine the firing error.

Miss distance -- A scorer which indicates the perpendicular distance from the munition trajectory at the point of closest approach to the target. It indicates scalar miss distance; however, no coordinate values are known.

Passive -- A system which does not contain a primary source of electromagnetic energy in the munition for scoring purposes. This type of scorer can be either active or passive, depending on the application, i.e., passive when tracking telemetry signal, active when used with a signal source installed in the vehicle being tracked.

Proximity-- A hit-miss device triggered by the entry of a munition into a spherical volume with the scorer at its center. This scorer will indicate only that the munition came within its sphere of influence. it will not differentiate within this sphere between near misses and far misses.

Trajectory -- A scorer capable of continuously defining the position of a missile in a sphere whose center coincides with the origin of the target's coordinate axes. The time-history record of the intercept must provide both range and angular position of missile with respect to the target's scoring requirements.

SCREEN -- To make a preliminary selection of information or documents to reduce the number examined at a later time.

SEA LEVEL -- In general, the surface of the sea used as a reference for elevation. In surveying and mapping, a curtailed form of mean sea level whose use should be avoided. If used this way it should be in the context of mean sea level.

SEA LEVEL DATUM -- A determination of mean sea level that has been adopted as a standard datum for heights.

SEA LEVEL PRESSURE -- The atmospheric pressure at mean sea level, either directly measured or (most commonly) empirically determined from the observed station pressure. In regions where the earth's surface is above sea level, it is standard observational practice to reduce the observed surface pressure to the value that would exist at that point at sea level if the air temperature at the surface were present all the way to sea level. In actual practice, the mean temperature for the preceding 12 hours is used. This "reduction of pressure to sea level" is responsible for many anomalies in the pressure fields of mountain areas on the surface synoptic chart.

SEARCH (computer) -- 1. A systematic examination of the available information in a specific field of interest. **2.** To scan available stored information.

SECOND (time) -- Unless qualified, the second of ephemeris time (ET). The second was defined as the fraction 1/31,556,925.9747 of the tropical year for January 1, 1900 at 12 hours ET. The second of universal time is defined as 1/86,400 of the mean solar day (which is not constant) and is known as the mean solar second.

SELF-DESTRUCT (safety) -- The result of fail-safe action.

SELF-HEATING (transducer) -- Internal heating resulting from electrical energy dissipated within the transducer.

SEMI-ACTIVE TRACKING SYSTEM -- A parasite system which tracks a signal source normally aboard the target for other purposes.

SENSING ELEMENT (transducer) -- Where applicable, that part of the transducer which responds directly to the measurand. This term is preferred over the term "primary element".

SENSITIVE AREA (safety) -- Any area outside the predetermined flight test area.

SENSITIVITY -- The change in the reading of a measuring instrument per unit of measured quantity. Sometimes called "sensibility" or "sensitiveness".

Receiver -- That characteristic which determines the minimum strength of signal input capable of causing a desired value of signal output. Maximum sensitivity is determined as the value of the minimum discernible input signal level. (Usually measured in decibels referred to 1 milliwatt.)

SENSITIVITY (continued)

Spectral -- The response of a photographic emulsion to each color of the visible spectrum.

Threshold -- The lowest level of the input signal which produces the desired response at the output.

Transducer -- The ratio of the change in the transducer output to a change in the value of the measurand.

Transverse -- **1.** In tape recording, the susceptibility of a track to interference from flux patterns generated by adjacent record heads. (See **cross talk**.) **2.** In transducers, the maximum sensitivity of a transducer to a specified value of transverse acceleration or other transverse measurand.

SENSITIVITY SHIFT (transducer) -- 1. A change in sensitivity from a reference value, i.e., a change from a responsive slope previously obtained which is due to any cause. **2.** A change in the slope of the calibration curve.

SENSITIVITY TIME CONTROL -- A circuit which controls the gain of a receiver as a function of the time after the initial radar pulse.

SENSITOMETRY -- The quantitative measurement of the response of photographic materials to radiant energy and developing methods.

SENSOR -- (See **transducer**.)

SENTINEL (computer) -- A symbol to mark a unit of information, e.g., the end of an item, field, block, tape, file, etc. (See **flag**.)

SEQUENTIAL COLLATION OF RANGE (SECOR) -- A spherical, long-baseline, phase-comparison trajectory measuring system using three or more ground stations, time sharing a single transponder, to provide nonambiguous range measurements to determine the instantaneous position of a missile in flight.

SEQUENTIAL CONTROL -- Control by completion of a series of two or more events.

SFERICS RECEIVER (lightning recorder) -- A type of radio direction finder which electronically measures the direction, intensity and rate occurrence of atmospheric events. In its simplest form, the instrument consists of two orthogonally crossed antennas whose output signals are connected to an

oscillograph so that one loop measures the east-west component. When combined vertically these signals give the azimuth.

SHEAR -- The variation (usually the directional derivative) of a vector field along a given direction in space, i.e., wind shear.

SHEAR LINE (meteorology) -- A line or narrow zone across which there is an abrupt change in the horizontal wind component parallel to this line; a line of maximum horizontal wind shear.

SHIFT (computer) -- The movement of bits, digits or characters to the left or right.

SHIFT, ARITHMETIC -- To multiply or divide a quantity by a power of the number base by shifting. For example: binary 1011 represents decimal 11; two arithmetic shifts to the left is binary 101100 which represents decimal 44.

SHIPPING HAZARD AREA (safety) -- That area within which the probability of a hit on a ship (assumed to be 500 ft. x 60 ft.) is greater than one in one hundred thousand (1:100,000).

SHOCK -- A force impulse of large magnitude applied for a short duration of time. An abrupt change in applied energy.

SHORT-BASELINE SYSTEM -- A trajectory measuring system using a baseline whose length is very small compared to the distance of the object being tracked.

SHORT RANGE AIR NAVIGATION (SHORAN) -- A precision distance measuring system employing a pulse timing principle to measure distance from an aircraft to one or more fixed responder ground stations. SHORAN is a pulse-type electronic ranging system originally designed for the positioning of bombing aircraft and later adapted for use in aerial photography, geophysical exploration, hydrography, and long-range geodetic surveying. Fundamentally, the system consists of a mobile transmitter-receiver-indicator unit and a fixed receiver-transmitter unit (transponder). Pulses are sent from the mobile transmitter and returned to the originating point by the transmitter. The indicator measures the time interval required for travel of a pulse between stations and converts this information into distance to the nearest thousandth of a mile. HIRAN is an acronym for high-precision SHORAN.

SHORT-RANGE DOPPLER (SHODOP) -- A short-range trajectory measuring system using the intersection of the ellipsoid of DOVAP and the hyperboloids of DOVAP ELSSE or Telemetry ELSSE during a ballistic missile launch.

SHOTGUN AIRCRAFT (safety) -- An aircraft equipped with-such armament as machine guns, cannons, or air-to-air rockets or missiles for destroying a missile or drone when other flight termination systems fail.

SHUTTER EFFICIENCY -- The ratio of the light reaching the film plane during an exposure to the theoretical amount of light reaching the film plane with the same optics and total time but with no shutter.

SHUTTER, LOUVRE -- A camera shutter resembling an old-fashioned window shutter, consisting of movable slats or blades which admit and exclude light. May be placed in front of, at the rear of, or near the focal plane of a lens.

SHUTTLE (camera) -- An oscillating claw in a motion picture camera or projector which pulls the film down one frame at a time.

SIDEBAND -- A band of frequencies on either side of a modulated signal including components whose frequencies are the sum or difference of the carrier and the modulation frequencies. The sum frequencies form the upper sideband and the difference frequencies form the lower sideband.

SIDE LOBE -- Small or minor lobes of energy radiated by an antenna in a divergent direction from the main beam.

SIGN DIGIT -- A one or a zero used to designate the algebraic plus or minus sign of a quantity.

SIGNAL --

Survey -- A natural or artificial object or structure whose horizontal and sometimes vertical position is obtained by surveying methods. Signals are given special designations according to the kind of surveying in which they are determined, or for which they may later serve.

Triangulation -- Any object, natural or artificial, whose position is obtained in a triangulation survey. The term may be applied to a structure whose position is determined by triangulation, but whose primary purpose is to serve later in a hydrographic or topographic survey, at which time it may become known as a hydrographic or topographical signal.

SIGNAL SEPARATION FILTER -- A bandpass filter which selects the desired signal or channel from a composite signal.

SIGNAL-TO-NOISE RATIO (SNR) -- Ratio of the power of the signal to the power of the noise. This ratio is usually expressed in terms of peak values in the case of

impulse noise and in terms of root mean square values in the case of random noise.

SIGNIFICANT DIGITS -- In a number, beginning at the point furthest to the left of the decimal point with the first digit not a zero and continuing to the right to the last digit that is not a zero.

SIGNIFICANT LEVEL (meteorology) -- An altitude level at which values of pressure, temperature and humidity are sufficiently important or unusual to warrant the attention of the forecaster.

SIMULATOR -- 1. A program or routine corresponding to a mathematical model or representing a physical model. **2.** A routine which runs on one computer and imitates the operations of another computer.

SINGLE CARRIER FM RECORDING -- A method of recording in which the input signal is frequency modulated onto a carrier and the carrier is recorded on a single track at saturation and without bias.

SINGLE SIDEBAND TRANSMISSION -- A carrier transmission in which one sideband is transmitted and the other is suppressed. The carrier wave may be either transmitted or suppressed.

SINGLE THEODOLITE OBSERVATION -- A common type of pilot-balloon observation which uses one theodolite.

SKEW (magnetic tape) -- Motion characterized any an angular velocity between the gap centerline and a line perpendicular to the tape center line. Generally used to describe the conditions which cause some degree of nonsynchronization of supposedly parallel bits when bit-coded characters are read from magnetic tape. Any physical skewing of the magnetic tape as it crosses the head contributes largely to this effect.

SKY SCREEN -- 1. A device using a radiation-sensitive pickup to view a definite area in space and to detect the passageway of any object through this space. **2.** An optical sighting device used to monitor a missile flight, consisting of a framework and grid lines or wires. The sky screen has been used as a range safety device. **3.** (ballistic camera) A camera with two movable slits at right angles to each other which mask off all light except the light coming from the object being photographed.

SKY WAVE -- An electromagnetic wave that travels upward into space and may or may not be returned to earth by reflection from the ionosphere. (See **ground wave**.)

SLANT RANGE -- 1. The line-of-sight scalar distance between two points, e.g., the distance between a ground instrumentation site and an airborne vehicle or between an airborne vehicle and its airborne target. **2.** The distance from one point to another at a different elevation. The observed distance measurements obtained with various types of geodetic ranging instruments including geodimeters, tellurometers, electrotapes, SHORAN, etc.

SLANT RANGE VECTOR -- Normally, the distance from a ground site to an airborne vehicle with the corresponding angular directions. (See **vector**.)

SLAVE ANTENNA -- A directional antenna that is positioned in azimuth and elevation by a servo system. The information controlling the servo system is supplied by a tracking or positioning system.

SLEW -- To rapidly change the aiming of an instrumentation mount (radar, optical, etc.) or a range gear assembly by injecting a controlled error signal into the positioning servo amplifier.

SNIFFER -- The term applied to a technique used in the AN/FPS-16 radar for determining if the output is noise or a signal.

SONIC DETECTION AND RANGING (SODAR) -- Sound wave transmitting and receiving equipment operating on principles analogous to those of radar. A SODAR is used for sounding the lower atmosphere for temperature discontinuities and small-scale scattering regions.

SONOBUOY -- An instrument designed to receive underwater sonic noises and retransmit them for radio reception.

SOUND FIXING AND RANGING (SOFAR) -- Principles of underwater sound transmission, reception and analysis used in connection with a Missile Impact Location System/Broad Ocean Area (MILS/BOA) network.

SOUNDING -- A measurement of the depth of water.

Geophysics -- Any penetration of the natural environment for scientific observation.

Meteorology -- Same as upper-air observation; in general, a single complete radiosonde observation.

SOURCE IMPEDANCE -- The impedance presented by the source to the input of the device.

SOURCE LANGUAGE -- The language used to prepare a problem as input for computer operations.

SOURCE PROGRAM -- A program or algorithm written in source language.

SPECTRUM ALLOCATION -- A frequency distribution to a service or function. Usually consists of a frequency band designated in the United States national or international tables of allocation.

SPECTRUM ANALYSIS -- An objective investigation into the potential frequency requirements of systems or equipment.

SPECTRUM MANAGEMENT -- A collective term embracing radio frequency management, engineering, compatibility efforts and the control of radiation from electrical devices.

SPECTRUM MANAGEMENT DOCTRINE -- Fundamental principles which guide the use of the electromagnetic spectrum for operation of telecommunications and command and control systems.

SPECTRUM RESOURCES -- Availability of portions of the electromagnetic spectrum for the accomplishment of a specific function.

SPECTRUM SURVEILLANCE -- The function of observing the manner in which the electromagnetic spectrum is used.

SPECTRUM UTILIZATION -- All aspects of actual use of the electromagnetic spectrum including numbers, types, details of frequency assignments, duration and location.

SPECTRUM UTILIZATION CHARACTERISTICS -- Describes RF equipment operational parameters as bandwidth, sensitivity, stability, antenna pattern, power output and the capability of the equipment to suppress unwanted electromagnetic energy.

SPHERICAL EXCESS -- The amount by which the sum of the three angles of a triangle on a sphere exceeds 180°.

SPHERICAL SYSTEM -- A trajectory measuring system whose locus of the measurand range is a sphere with the ground equipment at the center. A unique point in space is determined by the intersection of three or more spheres. The term "spherical system" has been applied to systems using three or more slant ranges to determine space position.

SPHERICAL WAVE -- A wave whose equiphase surfaces form a family of concentric spheres.

SPHEROID -- In general, any figure differing slightly from a sphere. In geodesy, a mathematical figure closely approaching the geoid in form and size, and used as a surface of reference for geodetic surveys.

SPINNER (radar) -- The motor assembly and shaft used to rotate or spin a dipole on its axis at the focal point of a parabolic reflector. Usually rotated slightly off center so that when the received energy is switched by quadrants, an error voltage is produced which is proportional to the amount the target being tracked is off the center of the spin axis. The error voltage derived by this technique is used by the positioning servos to drive the antenna in such a direction that it tends to correct the error present. (See **nutator**.)

SPURIOUS EMISSION -- Any undesired emission of an electromagnetic system on a frequency or frequencies outside the band necessary for transmission of intelligence.

SPURIOUS RESPONSE -- Output from a receiver due to a signal with frequencies other than the frequency to which the receiver is tuned.

SQUELCH -- A device which silences a receiver except when a carrier signal is being received.

SQUIB CHECK (safety) -- A resistance measurement of the squib wire made to assure that the circuitry and ignitor bridge wire are intact and in the proper resistance range.

SQUITTER -- Beacon replies generated without any intentional remote interrogation.

STABILITY --

Frequency -- The ability of an electromagnetic device to maintain a specified operating frequency under specified operating conditions.

Measuring instrument -- A measure of long-time precision. A measure of the constancy of systematic errors and bias errors. (See **accuracy; error, bias; error, systematic**.)

STABILIZED DATA -- The data output of an unstabilized radar antenna corrected for tilt and/or roll, such as shipboard installations, etc.

STADIA (geodetic) -- In its strictest use, refers to the graduated rod used in the determination of distance by observing the intercept on the rod subtending a small known angle at the point of observation. In practice, the angle is usually defined by two fixed lines in the reticle of a telescope (transit or telescopic alidade). The term "stadia" is also used in connection with surveys where distances are determined with a stadia, i.e., stadia survey, stadia method, stadia distance, etc. Also used to designate parts of instruments used, i.e., stadia wires.

STALO -- A highly stable oscillator. Usually stabilized by feedback from a high-Q L-C circuit such as a high-Q cavity.

STANDARD --

General -- An exact value, a physical embodiment, or a concept that has been established by authority, custom or agreement to serve as a model or rule in the measurement of quantity, or in the establishment of a practice or procedure.

Primary -- International and national prototype standards of the highest possible accuracy and precision.

Qualification -- An accurate measuring instrument used to make system performance tests or adjustments, i.e., data collection systems, missile systems and command control systems.

Reference -- A standard which acts as a reference against which lower level standards are compared.

Secondary -- A unit defined as a specified multiple or submultiple of a primary standard.

Working -- A standard used for calibration of shop instruments, qualification standards and precision system components.

STANDARD ATMOSPHERE -- A reference atmosphere.

STANDARD DEVIATION (σ) -- A measure of dispersion of data points around their mean value. The positive square root of the arithmetic mean of the squares of the deviations from the arithmetic mean of the population:

$$s = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - m)^2}$$

where μ=population mean., n the size of the population, and X_i the characteristic of the i^{th} member of the population. The standard deviation can be estimated from a sample (n) of observations. This estimate of the standard deviation (s) is:

$$s = \sqrt{\sum \frac{\left(x_i - \bar{x}\right)^2}{n-1}}$$

where x is the mean of the observed sample.

STANDARD ERROR OF ESTIMATE (S) -- A measure of the dispersion (scatter) of data points with respect to a curve of regression. The positive square root of the arithmetic mean of the squares of the deviations from a curve of regression:

$$S = \sqrt{\sum \frac{d_r^2}{n}}$$

where S is the measure of tracking noise and of the precision. Note that S is not a measure of bias errors and is not a measure of most other systematic errors. (See **curve of regression; precision**.)

STANDARD ERROR OF MEAN -- A measure of the dispersion of sample means around the population mean obtained by dividing the standard deviation (σ) by the square root of the sample size "n". It is estimated by dividing the estimate of the standard deviation "s" by "$\sqrt{n}$."

STANDARDIZE (computer) -- To adjust the exponent and coefficient of a floating-point result so that the coefficient lies in a prescribed normal range.

STANDARD PRESSURE -- 1. (meteorology) The arbitrarily selected atmospheric pressure of 1,000 mb to which adiabatic processes are referred for definitions of potential temperatures, equivalent potential temperatures, etc. Other pressures may be used for specific purposes. **2.** (physics) A pressure of one standard atmosphere.

STANDARD TEMPERATURE -- 1. (meteorology) Although not commonly used, refers to the temperature at zero pressure altitude in the standard atmosphere (15°C). **2.** (physics) Usually the ice point (O°C); less frequently, the temperature of maximum water density (4°C).

STANDING WAVE -- A pattern of waves on conductors or in space created by two waves of the same frequency traveling in opposite directions. (See **voltage, standing wave ratio**.)

STAR TRACKER -- A telescopic instrument on a missile or other flight-borne object that locks onto a celestial body and gives guidance to the object during flight. A star tracker may be optical or radiometric.

STATE COORDINATE SYSTEMS -- The plane-rectangular coordinate system established for each state by the United States Coast and Geodetic Survey. State plane coordinates are extensively used in recording land surveys.

STATIC CALIBRATION (transducer) -- A calibration performed under ambient room conditions by application of the measurand to the transducer in discrete amplitude intervals.

STATIC ERROR BAND (transducer) -- The error band applicable at ambient room conditions and in the absence of any vibration, shock or acceleration.

STATION -- A definite point on the earth whose horizontal location has been determined by surveying methods. A point on a traverse over which an instrument is placed (a setup). Also, on a traverse, a length of 100 feet measured on a given broken, straight or curved line. A station may or may not be marked on the ground. A station is usually defined by the addition of a term which describes its origin or purpose, i.e., triangulation station, topographic station, magnetic station, etc. A station is often marked on the ground by a natural or specially constructed artificial structure. (See **survey mark**.)

Instrument (leveling) -- The point over which a leveling instrument is placed for the purpose of taking a backsight, a foresight, and such extra foresights as may be necessary from that instrument station. Except in rare instances, the instrument stations in a line of levels are not marked points such as traverse stations, triangulation stations, etc.

Intersection -- An object whose horizontal position is determined by observations made entirely from other stations. Where the object is observed from only two stations, the position is termed a "no-check position" since there is no proof that such observations are free from errors. Intersection stations are either objects which it would be difficult to occupy with an instrument, or survey signals whose positions can be determined with sufficient accuracy without being occupied.

STATION -- (continued)

Principal -- A station through which basic data are carried in the extension of a survey system. Also called a "main-scheme station", a principal station serves primarily for the continued extension of a survey. This requires a higher order of accuracy and precision in its determination if its purpose is limited to the control of local surveys or the establishment of supplementary stations.

Subsidiary -- A station established to overcome some local obstacle to the progress of a survey and not to determine position data for the station point. Subsidiary stations are usually temporary in character and not permanently marked. If serving the additional purpose of supplying control for a local survey station, such a station may be permanently marked. It is then a supplementary station.

Supplementary -- An auxiliary survey station established to increase the number of control stations in a given area or to place a station in a location where it is impracticable or unnecessary to establish a principal station. Supplementary stations are permanently marked and are established with an accuracy and a precision somewhat lower than is required for a principal station since they do not serve as bases from which extensive surveys are made.

STATION CONSTANTS -- Parameters usually associated with instrumentation sites, e.g., survey coordinates, zeroing corrections, etc.

STEP CALIBRATION; INTERVAL CALIBRATION -- A calibration procedure in which the stimulus is applied in discrete increments and/or decrements.

STEP WEDGE -- A photographic emulsion having a series of known and reproducible exposures of proper light intensity and color quality. Each exposure increases by a known factor from the preceding one. Often called "sensitometric strips", "control strips", "step tables", etc.

STIMULUS -- (See **measurand**.)

STOCHASTIC -- A trial and error procedure which results in converging on a solution.

STOP (photography) -- Indicates the size of the aperture which varies the amount of light passing through the lens of the camera. Sometimes called "f-stop" or "aperture stop". (See **diaphragm; T-stop**.)

STORAGE (computer) -- Any device by which units of information can be copied and retained, and from which information can later be obtained. Synonymous with the term "memory."

Buffer -- A synchronizing element usually located between two different forms of storage (internal and external). An input device in which information is assembled from external or secondary storage and retained for transfer to internal storage. An output device into which information is copied from internal storage and held for transfer to secondary or external storage. In all cases, computation continues while transfers between storage and secondary or internal storage (or vice versa) take place.

Circulating -- A device using a delay line or unit to store information in a train or pattern of pulses. The pattern of pulses at the final end are sensed, amplified, reshaped, and reinserted in the delay line at the beginning end.

Dynamic -- A storage technique whereby information at a certain position is moving in time and therefore not always available instantly, e.g., acoustic delay line, magnetic drum, circulating or recirculating of information in a medium.

Electrostatic -- A device for storing changeable information in the form of charged or uncharged areas on the screen of a cathode ray tube.

Erasable -- Reusable media such as magnetic tapes, drums, cores, etc., which hold information that can be changed.

External -- Storage facilities divorced from the computer itself which hold information in the form prescribed for the computer, e.g., magnetic tapes, magnetic wire, punched cards, etc.

Internal -- Storage facilities forming an integral part of the computer and directly controlled by the computer; the total storage automatically accessible to the computer.

Magnetic -- Any storage system which uses the magnetic properties of materials to store information.

Mercury -- Columns of a liquid mercury medium used as a storage element by the delaying action or time of travel of sonic pulses. The pulses are circulated by electrical-amplifier, shaper, and timer circuits which complete the loop.

Nonerasable -- Media used for containing information which cannot be erased, e.g., punched paper tapes and punched cards.

STORAGE (computer) -- (continued)

Nonvolatile -- Storage media which retain information in the absence of power and which may be made available upon restoration of power, e.g., magnetic tapes, drums, or cores.

Parallel -- Storage in which all bits, characters or words are essentially equally available. Parallel storage contrasts with serial storage. When words are in parallel, the storage is said to be parallel by words. When characters within words or binary digits within words or characters are dealt with simultaneously (not one after the other), the storage is parallel by characters or by bit, respectively.

Secondary -- Storage facilities which are not an integral part of the computer but directly connected to and controlled by the computer, e.g., magnetic drum, magnetic tapes, etc.

Serial -- Storage in which the units of information are accessed sequentially. Storage in which words appear one after the other in time sequence is said to be serial by word. Storage in which the individual bits comprising a word appear in time sequence is serial by bit.

Static -- Storage in which information is fixed in space and available at any time, e.g., flip-flop, electrostatic or coincident--concurrent magnetic core storage.

Temporary -- Internal storage locations reserved for intermediate and partial results.

Volatile -- Storage media such as acoustic delay lines and electrostatic tubes whose information can be lost if electrical power is cut off.

Working -- That portion of an internal storage device reserved for data upon which operations are being performed.

Zero-access -- A storage device whose latency period (waiting time) is always negligible.

STORAGE DUMP (computer) -- A printout of the contents of all or part of a particular storage device.

STORAGE REGISTER (computer) -- A special register which is used for both arithmetic and control functions. It has a capacity of one word and serves as a buffer between core storage and the central processing unit. Not to be confused with a particular storage cell in general storage.

STORED PROGRAM COMPUTER -- A computer which can alter its instructions in storage as though they were data and subsequently execute the altered instructions.

STORING TEMPERATURE (transducer) -- The temperature at which a transducer may be stored or transported. The transducer is not necessarily expected to remain within its specified limits of error if the temperature falls outside the operating temperature range of the instrument.

STRAIGHT BINARY -- Same as pure or natural binary number notation.

STRAIN (optical) -- A defect in glass caused by internal stress due to poor annealing, a lack of a uniform coefficient of expansion or mechanical deformation. Strain can be detected by examination in polarized light.

STRAIN GAGE FACTOR -- A measure of the transfer function as of strain-sensitive resistive materials. Numerically expressed as:

$$GF = \frac{\Delta r / R}{\Delta p / L}$$

where $\Delta r/R$=unit change in resistance, $\Delta p/L$=unit change in length. Often synonymous with "gage sensitivity".

STRATOPAUSE -- The top of the stratosphere; corresponds to the level of maximum temperature at approximately 50 to 55 km.

STRATOSPHERE -- 1. The atmospheric shell above the troposphere and below the mesosphere which extends from the tropopause to the height where the temperature becomes isothermal in the 50 to 55 km region. The temperature in the stratosphere ranges from about -55°C to O°C (-67°F to 32°F). The outstanding feature of the stratosphere's circulation pattern is its persistence; however, when changes do occur, they occur rapidly. The composition of stratospheric air is basically the same as that of the lower atmosphere, with the addition of ozone. **2.** Used erroneously to denote all the atmosphere above the troposphere.

STREAK CAMERA -- A camera in which the phenomenon to be observed is imaged on a narrow slit in the entrance plane of the camera. There are two types of streak cameras. The first type has film moving past the slit during the time of exposure. The second type has internal optics which image the slit onto the focal plane. When either the film or image is moved, a streaked image of the object being photographed results.

STRENGTH OF FIGURE (triangulation) -- The comparative precision of computed lengths in a triangulation net as determined by the size of the angles, the number of conditions to be satisfied, and the distribution of baselines and points of fixed position. Strength of figure in triangulation is not based on an absolute scale, but on an expression of relative strength. The number expressing the strength of a triangulation figure is really a measure of its weakness, since the number determined by formula increases in size as the strength decreases. The strength of figure is derived from that portion of the formula for probable error of a triangle side which is independent of the accuracy of the observations as follows:

$$\frac{N_d - N_e}{N_d} \quad \sum \left[d^2 A + d A d B + d^2 B \right]$$

in which N_d and N_c are the numbers of directions observed and of conditions to be satisfied and A and B are the rates of change of the sines of the distance angle A and B, usually expressed by the differences of the logarithms of the sines for a difference of 1" in the angles; the sixth decimal place being the unit place. By summing up the values obtained by formula for the simple figures composing a triangulation net, the strength of figure of the net is obtained. Since a triangulation net is usually composed of several different systems of simple figures, comparable values of the different systems are obtained, and the strongest route can then be selected through which to carry a computation of length. Reconnaissance for a proposed triangulation net is usually executed under instructions which specify limiting values of strength of figure for the best and second-best chains of triangles between adjacent lines, the sites for stations and for baselines being selected accordingly. Where desirable, the length of a section may be reduced by inserting an additional baseline, and the numbers representing the strength of figure reduced accordingly.

STRIA -- A streak of material within glass of a different composition and, hence, a different refractive index (looks like partially mixed glycerine in water). Acceptability of stria varies according to the function of the element in the system. (Plural: striae.)

SUBCARRIER -- A carrier which is applied as a modulating wave to modulate another carrier or an intermediate subcarrier.

SUBCARRIER BAND -- A band associated with a given subcarrier and specified in terms of a maximum subcarrier deviation.

SUBCARRIER OSCILLATOR -- In a telemetry system, the oscillator which is directly modulated by the measurand or by the equivalent of the measurand in terms of changes in the transfer elements of a transducer.

SUBCOMMUTATION -- Commutation of additional channels with output applied to individual channels of the primary commutator. Subcommutation is synchronous if its rate is a submultiple of that of the primary commutator. Unique identification must be provided for the subcommutation frame pulse. (See **commnutation**.)

SUBCOMMUTATION FRAME -- In PCM systems, a recurring integral number of subcommutator words which includes a single subcommutation frame synchronization word. The number of subcommutator words in a subcommutation frame is equal to an integral number of primary commutator frames. The length of a subcommutation frame is equal to the total number of words or bits generated as a direct output of the subcommutator.

SUBFRAME -- A complete sequence of frames during which all subchannels of a specific channel are sampled once.

SUBREFRACTION -- Refraction less than usual or less than some standard. The standard which is commonly used for radio frequencies up to 20 GHz is a gradient of 12 N-units per 1,000-feet altitude.

SUBROUTINE (computer) -- A sequence of instructions necessary to direct computer to carryout a well-defined mathematical or logical operation; subunit of a routine.

SUMMATION CHECK (computer) -- A check in which groups of digits are summed, usually without regard for overflow. The sum is then checked against a previously computed sum to verify accuracy.

SUPERCOMMUTATION -- A higher rate of commutation attained by connecting a single data input source to equally spaced contacts of the commutator (crosspatching). Corresponding crosspatching is required at the decommutator.

SUPERREFRACTION -- Refraction greater than usual or greater than some standard.

SURFACE CHART; SEA-LEVEL CHART -- An analyzed synoptic chart of surface weather observations. Essentially, a surface chart shows the distribution of sea level pressure and, therefore, the positions of highs, lows, ridges, and troughs, and the location and nature of fronts and air masses. Often added to this are symbols of occurring weather phenomena, analysis of pressure

tendency (isallobars), indications of the movement of pressure systems and fronts, and perhaps others depending upon the intended use of the chart. Although the pressure is referred to mean sea level, all other elements on this chart are presented as they occur at the surface point of observation. Such a chart is commonly referred to as a "weather map." When a surface chart is used in conjunction with constant pressure charts of the upper atmosphere, as in differential analyses, sea-level pressure is usually converted to the height of the 1,000-mb surface. The chart, then, is usually called the "1,000-mb chart."

SURFACE ELECTRONIC COUNTERMEASURES (ECM) -- All types of electronic jamming or deception performed by ground-based or shipboard equipment.

SURVEY -- 1. The orderly process of determining data relating to any physical or chemical characteristics of the earth. **2.** The associated data obtained in a survey.

Cadastral -- A survey relating to land boundaries and subdivisions, made to create units suitable for transfer or to define the limitations of title. Commonly used to designate surveys of the public lands of the United States including retracement surveys for the identification and resurveys for the restoration of property lines. The term may also be applied properly to corresponding surveys outside the public lands, although such surveys are usually termed "land surveys."

Control -- A survey which provides positions (horizontal, vertical) of points to which supplementary surveys are adjusted. The fundamental control survey of the United States provides the geographic positions (and plane coordinates) of thousands of triangulation and traverse stations and the elevations of thousands of bench marks which are used for the bases of hydrographic surveys of the coastal waters, for the control of the topographic survey of the United States, and for the control of many state, city and private surveys.

Engineering -- A survey executed for the purpose of obtaining essential information for planning an engineering project or for developing and estimating its cost.

Exploratory -- A survey of certain areas to obtain general information not previously recorded.

SURVEY -- (continued)

Geodetic -- A survey which takes into account the figure and size of the earth. Prescribed precision and accuracy of results are obtained through the use of special instruments, field methods and formulas based on the geometry of a mathematical figure approximating the earth in form and size. Also called "geodetic engineering".

Geographic -- A general term covering a wide range of surveys including exploratory surveys and basic topographic surveys.

Geologic -- A survey or investigation of the character and structure of the earth, the physical changes which the Earth's crust has undergone or is undergoing and the causes producing those changes.

Hydrographic -- A survey of data relating to bodies of water. Such a survey may consist of the determination of one or several of the following classes of data: depth of water and configuration of bottom, directions and force of currents, heights and times of tides and water stages and location of fixed objects for survey and navigational purposes.

Land -- The determination of boundaries and areas of tracts of land. Land boundaries are usually defined by ownership, commencing with the earliest owners and continuing through successive ownerships and partitions. Land surveying includes the re-establishment of original boundaries and the establishment of such new boundaries as may be partitions.
Land surveying includes the re-establishment of original boundaries and the establishment of such new boundaries as may be required in the partition of the land. The term "cadastral survey" is sometimes used to designate a land survey, but in this country its use should be restricted to the surveys of the public lands of the United States.

Plane -- A survey in which the surface of the earth is considered a plane surface. The curvature of the earth is neglected and computations are made using the formulas of plane geometry and plane trigonometry. In general, plane surveying is applied to surveys of land areas and boundaries where the areas are of limited extent or the required accuracy is so low that corrections for the effect of curvature would be negligible as compared with the errors of elevation. For small areas, precise results may be obtained with plane surveying methods, but the accuracy and precision of such results will decrease as the area surveyed increases in size.

SURVEY -- (continued)

Reconnaissance -- A rapidly executed, relatively low cost survey usually conducted to obtain strategic information. Such information often takes the form of a map or sketch.

Topographic -- A configuration (relief) of the surface of the earth and the location of natural and artificial objects thereon. A topographic survey is usually published as a topographic map.

Trilinear -- Determination of the position of a point of observation by measuring the angles at that point between lines to three points of known position. This involves solution of the three-point problem, which is accomplished analytically by computation of chorographically using a station pointer, such as the three-arm protractor. (See **resection**.)

SURVEY MARK -- A general term used to designate a marked point on the Earth's surface either horizontal (triangulation station), vertical (bench mark), or a combination of the two. In other cases, it may designate stations at which special observations were taken, such as gravity station, magnetic station, seismological station, etc. The term "bench mark" is used by many nontechnical range personnel to designate any and all marks located by surveying procedures. This practice should be discouraged, and the term "bench mark" should be used only for vertical locations, a triangulation or traverse station mark for horizontal locations, and a survey mark to designate a special-purpose mark including a mark combining both horizontal and vertical locations.

SURVEY NET --

Horizontal control -- Arcs of triangulation (sometimes with lines of traverse) connected to form a system of loops or circuits extending over an area. Variously termed "triangulation net", "traverse net", etc.

Vertical control -- Lines of spirit leveling connected to form a system of loops or circuits extending over an area. Also called a "level net". (See control, **natural control survey net**.)

SURVEY TRAVERSE -- A sequence of lengths and directions of lines between points on the earth obtained by or from field measurements and used in determining positions of the points. A survey traverse may determine the relative positions of the points which it connects in series. If tied to control stations on an adopted datum, the positions may be referred to that datum. Survey traverses are classified and identified as follows: according to methods employed, purpose served, results obtained, etc.

SURVEY TRAVERSE (continued)

Astronomical -- A survey traverse in which the geographic positions of the stations are obtained from astronomic observations, and lengths and azimuths of lines are obtained by computation.

Closed -- A survey traverse which starts and ends upon the same station or upon stations whose relative positions have been determined by other surveys.

Geographical exploration -- A routine followed across some part of the earth, approximate positions along which are determined by surveying or navigational methods.

Open -- A survey traverse which starts from a station of known or adopted Position but does not end upon such a station.

Random -- A survey traverse run from one survey station to another station which cannot be seen from the first station to determine their relative positions.

Second-order -- A survey traverse which by itself forms a closed loop or which extends between adjusted stations of first- or second-order control surveys. The criteria for attaining the required accuracy are: number of azimuth courses between azimuth checks not to exceed 25; probable error of astronomic azimuth 2.0", azimuth closure at azimuth checkpoints not to exceed 10 $s\sqrt{N}$ for long traverses or 3.0" per station for short traverses, distance measurements accurate to 1 in 15,000, closing error in position not to exceed 1.67 $ft\sqrt{Miles}$ for long traverses or 1 in 10,000 for short traverses.

Third-order -- A survey traverse which by itself forms a closed loop or which extends between adjusted stations of other control surveys. The criteria for attaining the required accuracy are: number of azimuth "a" courses between azimuth checks not to exceed 50, probable error of astronomical azimuth=5.0," azimuth closure at azimuth checkpoints not to exceed 30 $s\sqrt{N}$ for long traverses and 8.0" per station for short traverses; distance measurements accurate within 1 in 7,500; closing error in position=3.34 $ft\sqrt{Miles}$ for long traverses and 1 in 5,000 for short traverses.

Ultra-high order -- Used for extended baselines to control stellar camera operations using the simultaneous method. Lines are measured-by a geodimeter in a double configuration, LaPlace azimuth stations at alternate stations, first-order class I triangulation procedures at angle stations, and

various other precision techniques. Results obtained have probable errors no greater than 1 in 1,000,000 in length and 1.2".

SYMBOLIC ADDRESS (computer) -- An address not permanently assigned.

SYMBOLIC CODING -- Coding in which the instructions are written in nonmachine language, i.e., coding using symbolic notation for operators and operands.

SYMBOLIC LOGIC -- Strict reasoning about non-numerical relations using symbols that are efficient in calculation. One type of symbolic logic is Boolean algebra.

SYNCHRONIZATION -- The maintenance of one operation in step with another, also called "sync".

SYNCHRONIZATION, RADAR --

Tight -- A condition whereby the time displacement between distant radars is closely controlled so that there is a small relative jitter between transmitted pulses.

Loose -- A condition whereby separated radars are allowed a relative jitter between transmitted pulses. The amount of jitter is determined by the method of compensation for time displacement used and the relative displacement between these radars.

SYNCHRONOUS -- 1. In step or in phase as applied to two devices or machines. **2.** A term applied to a computer in which the performance of a sequence of operations is controlled by equally spaced clock signals or pulses.

SYNCHRONOUS SHUTTER -- A motor-driven rotating shutter system operating at a synchronous rate with an ac power source. Ideally, shutters of multiple instruments in a ballistic measurements network operate simultaneously at a synchronous rate.

SYNOPTIC CHART -- A chart which is prepared in brief, coded, synoptic form.

T

TABLE LOOKUP (Computer) -- The process of using a known value (the argument) to locate the unknown value (the function) in a list or table.

TACHYMETER; TACHEOMETER, TACHOMETER -- A surveying instrument used for the rapid determination of distance, direction, and difference of elevation from a single observation. There are several forms of instruments which might be called tachymeters: **1.** An instrument in which the baseline for distance determinations is an integral part of the instrument. This is the type of instrument to which the term "tachymeter" is usually applied. Although range finders with self-contained bases belong to this class, they are usually referred to as range finders because they do not determine elevation. **2.** An instrument equipped with stadia wires or gradients whose base for distance determinations is a graduated rod held at the distant point. **3.** An instrument for measuring angular speed in rpm.

TACTICAL AIR NAVIGATION (TACAN) -- A two-dimensional system which provides azimuth and distance to a fixed ground station for navigating piloted aircraft. Distance is determined by pulse interrogation of the ground station with time comparison to the returned pulse. Azimuth is provided by comparison of a continuous wave audio signal from pulse amplitude to reference pulses.

TAG (computer) -- A specific identifier such as a label, an index, etc.

TANGENTIAL ACCELERATION -- The component of acceleration tangent to the trajectory.

TANGENT PLANE -- A plane that touches a curved surface at one and only one point. In geodetic work, a plane tangent to the spheroid at any point is perpendicular to the normal at that point. Tangent planes have been used in computing map projections for small areas.

TAPE-CONTROLLED CARRIAGE -- An automatic paper-feeding printer carriage controlled by a punched paper tape.

TAPE CORRECTIONS (survey) -- Corrections applied to a distance measured with a tape to eliminate errors caused by the physical condition of the tape and the manner in which it is used.

TAPE MARK -- A special record indicating end-of-file. (See **end-of-file mark**.)

TAPE-TO-CARD (computer) -- Pertaining to equipment **or** methods which transfer information directly from tape to cards; usually an off-line operation.

TARGET BOARD -- A board usually painted in a distinctive pattern, having a known geometrical relation to a camera and used for determining the orientation of that camera.

TARGET COORDINATE SYSTEM -- A Cartesian coordinate system with origin located at a given point on the target and with the coordinate system axis referenced to the target in a given manner.

TARGET LINE -- A given line containing a target in a specified manner and referenced in terms of the target coordinate system.

TARGET PLANE -- A predetermined geometrical plane containing the target in a specified manner.

TARGET TRAJECTORY INDICATOR -- A device that indicates the target trajectory in terms of the missile coordinate system when the target is within a predetermined distance from a specified point on the missile.

TECHNICAL PHOTOGRAPHY -- The recording of photographic images for information relevant to some engineering phenomenon of a qualitative nature.

TECHNICAL SEQUENTIAL PHOTOGRAPHY -- Slow or rapid sequence photography where time coordinates are recorded on the film as the event is filmed. Sometimes referred to as "engineering sequential photography".

TELECOMMUNICATION -- Any transmission of information by an electronic system.

TELECOMMUNICATIONS SERVICE -- The specific function performed by equipment designed for the transmission of information.

TELEMETERING -- 1. Measurements accomplished with the aid of intermediate means which allow perception, recording or interpretation of data at a distance from a primary sensor. The widely employed interpretation of telemetering restricting its significance to data transmitted by means of electromagnetic propagation is more properly called telemetry. **2.** A system for taking measurements within an aerospace vehicle in flight and transmitting them by radio to a ground station.

TELEMETRY -- 1. An electrical system which measures a quantity and transmits the result to a distant station where the quantity measured is recorded. Interpretation is not part of the telemetry process. **2.** The use of telecommunications for automatically indicating or recording measurements at a distance from the measuring instrument.

TELEMETRY ELSSE -- Electronic skyscreen equipment (ELSSE) which uses the telemetry transmitter as a signal source.

TELEPHOTO LENS -- A photographic lens constructed so that the total distance from the foremost part of the lens to the film plane is less than effective focal length.

TELESCOPE --

Modified Cassegrainian Type -- A reflecting telescope system employing an elliptical (nonparabolic) primary mirror and a spherical secondary mirror.

Modified Gregorian Type -- A reflecting telescope system employing a hyperbolic primary mirror and a spherical secondary mirror.

Newtonian -- A reflecting type telescope whose primary image is observed through a hole in the side of the tube.

True Cassegrainian Type -- A reflecting telescope system employing a concave parabolic primary mirror and a convex hyperbolic secondary mirror.

True Gregorian Type -- A reflecting telescope system employing a concave parabolic primary mirror and a concave elliptical secondary mirror.

TELLUROMETER -- An electronic instrument using radio microwaves for distance measurement. Generally used on second-order traverse and trilateration. Can be used as a first-order instrument when the distance measured approximates 10 miles or more, since the uncertainty of a single set of measurements is on the order of 1/2 foot.

TEMPERATURE EFFECT (transducer) -- The difference between the output at room temperature and that of any other specified temperature for any one value of the stimulus within the range of the measuring device.

TEMPERATURE ERROR (transducer) -- The maximum change in output at any measurand value within the specified range when the transducer temperature is changed from ambient room temperature to specified temperature extremes.

TEMPERATURE GRADIENT ERROR (transducer) -- The transient deviation in the output of a transducer at a given measurand value when the ambient temperature of the measurand changes at a specified rate between specified magnitudes.

TEMPERATURE INVERSION -- A layer in which temperature increases with altitude. Since the principal characteristic of an inversion layer is its stability, very little turbulence occurs within it. Strong wind shears, often occur across inversion layers and abrupt changes in concentrations of atmospheric particulates and atmospheric water vapor may be encountered when ascending through an inversion. When an inversion is mentioned in meteorological literature and discussion, a temperature inversion is usually meant.

TERA -- Prefix denoting trillion (1×10^{12}=1,000,000,000,000).

TERMINAL-BASED LINEARITY -- (See **linearity, end point**.)

TERRESTRIAL REFRACTION ERROR -- The angular error for ground observation of an object in the vicinity of the earth. The distinction between terrestrial and astronomical refraction does not depend on whether the object is within the appreciable atmosphere, but on whether it is at an effectively infinite distance. For a terrestrial object, the refraction error is not equal to the total bending of a ray between object and observer. Often called, simply, "terrestrial refraction."

TEST AREA (safety) -- Designated surface area and necessary operating airspace associated therewith suitable for bombing, gunnery, rocketry, or other testing and training activities.

TEST AREA CLEARANCE (safety) -- Visual and/or radar surveillance of a test area from the surface or from the air prior to a mission to ensure that the danger area is clear of personnel, vehicles, nonmission aircraft and surface vessels. Visual methods are preferred for water surface clearance; however, suitable airborne or ship radar may be used to perform this function when weather conditions or darkness prevent use of visual methods.

TEST FORCE -- The group responsible for conducting test and evaluation activities when participation by more than one agency is required. The requirement for a test force and designation of participants is noted in appropriate system or project documentation and applies primarily to system testing activities to project or engineering service efforts when large-scale operations are involved.

THEODOLITE -- 1. An instrument for measuring horizontal and vertical angles; a transit. **2.** A precision surveying instrument mounted on an accurately graduated circle, equipped with necessary levels and reading devices, and consisting of an alidade with telescope. Usually, the alidade carries a graduated vertical circle.

THEODOLITE (continued)

Direction -- A theodolite in which the graduated horizontal circle remains fixed during a series of observations. The telescope is pointed on a number of signals or objects in succession, and the direction of each is read on the circle, usually by means of micrometer microscopes.

Optical -- A theodolite which has the horizontal and vertical circles graduated on glass. It is read through an arrangement of prisms which bring the images of opposite portions of either of the circles into the field of view of a reading microscope mounted alongside the telescope. The graduation marks in the two images are brought into coincidence by mechanical means and the circles are read by means of an auxiliary seconds scale. This scale is read to single seconds or to a decimal part of a second without moving from the eye end of the telescope. A single reading thus obtained is the mean of two readings of diametrically opposite points on the graduated circle.

Photo -- An instrument that measures horizontal and vertical angles and records these angles on photo emulsion; a cinetheodolite. An instrument used in terrestrial photogrammetry, consisting of a theodolite and camera combination which uses the same tripod. In some models, the theodolite and camera can be used separately; in other models, the two are combined into a single instrument.

Repeating -- A theodolite so designed that successive measures of an angle may be accumulated on the graduated circle and a final reading of the circle, which represents the sum of the repetitions, may be made. The observed value of the angle is obtained by dividing the total arc passed through in making the series of observations by the number of times the angle has been observed. The total arc may include several complete circuits of the circle which may be added to the circle reading before making the division. The repeating theodolite is also called a "repeating instrument " Theoretically, it is an instrument of great precision, but in mechanical operation its results are not as satisfactory as those of the direction instrument.

THEORETICAL CURVE (transducer) -- The specific relationship (presented in a table, graph or equation) of the transducer output to its applied measurand over the range.

THERMAL COEFFICIENT OF RESISTANCE -- The change in the resistivity of a substance due to the effects of temperature only; usually expressed in ohms per degree of temperature change.

THERMAL COMPENSATION -- A method employed to reduce or eliminate the thermal effects on one or more of the performance parameters of a transducer. (See **zero compensation**.)

THERMAL ZERO SHIFT -- The change in output at zero measurand due to the effects of temperature only; usually expressed in percentage of full-scale output at room temperature per unit (or interval) of change in temperature.

THERMISTOR -- A thermally sensitive resistor whose primary function is to exhibit a change in electrical resistance with a change in temperature. Usually a metallic oxide semiconductor which exhibits a high negative temperature coefficient of resistance change.

THERMOCOUPLE (transducer) -- A transducer whose output depends on the production of an electromagnetic force (emf) in two dissimilar metals as a function of the temperature.

THERMOSPHERE -- The atmospheric shell extending from the top of the mesosphere to outer space. It is a region of more or less steadily increasing temperature with height, starting at 70 or 80 km. The thermosphere includes, therefore, the exosphere and most or all of the ionosphere.

THICKNESS -- In synoptic meteorology, the vertical depth (measured in geometric geopotential units) of a layer in the atmosphere bounded by the surfaces of two different values of the same physical quantity, usually constant-pressure surfaces.

THEORETICAL END POINTS (transducer) -- The specified points between which the theoretical curve is established and no end point tolerances apply.

THREE-ADDRESS INSTRUCTION (computer) -- A coded program which includes an operation and specifies the location of three registers.

THREE-POINT PROBLEM -- (See **resection**.)

THRESHOLD -- The point at which an effect is first produced, observed or otherwise indicated.

THRESHOLD (transducer) -- The smallest change in the measurand that will result in a measurable change in the transducer output.

THRU-PUT TIME (computer) -- The total elapsed time from the moment the raw data is received until the processed data is delivered to the user. (See **turnaround time**.)

TIME -- The measurable aspect of duration. Time makes use of scales based upon the occurrence of periodic events. These are: the day, depending upon the rotation of the earth; the month, depending upon the revolution of the Moon around the earth; and the year, depending upon the revolution of the earth around the Sun. Time is expressed as a length on a duration scale measured from an index on that scale. For example: 4 p.m. local mean solar time means that 4 mean solar hours have elapsed since the mean Sun was on the meridian of the observer.

Apparent solar -- Time measured by the apparent diurnal motion of the "true" Sun. Also termed "true solar time" and often "apparent time." At any given instant, the apparent solar time is the hour angle of the true Sun. In civil life, apparent solar time is counted from the two branches of the meridian through 12 hours; the hours from the lower branch are marked a.m. (ante meridian); those from the upper branch, p.m. (post meridian). In astronomical work, apparent solar time is counted from the lower branch of the meridian through 24 hours (see **astronomical time**) and the civil day has taken the place of the astronomical day. Naming the meridian of reference is essential to the complete identification of the time. For example: 75th meridian apparent solar time, Greenwich apparent solar time and local apparent solar time which cites the meridian of the observer. (See **time, equation of**.)

Astronomical -- Solar time in an astronomical day that begins at noon. It may be either apparent solar time or mean solar time and is counted from noon in a single series of 24 hours. Since 1925, civil time has been used instead of astronomical time.

Atomic (AT) -- A uniform time based on atomic resonance. Atomic time and ephemeris time are now assumed to be equivalent. (See **second; time, ephemeris; time, universal; U.S. frequency standard**.)

Civil -- Solar time in a civil day that begins at midnight. It may be either apparent solar time or mean solar time, and may be counted in two series of 12 hours each, beginning at midnight marked "a.m." for ante meridian, at noon marked "p.m." for post meridian, or in a single series of 24 hours beginning at midnight.

Daylight saving -- A substitute for standard time; clocks showing standard time are changed to daylight saving time by moving the hands ahead exactly 1 hour. The time in a given time belt is identified by the particular designation of the belt, i.e., Eastern Daylight Saving Time, Central Daylight Saving Time, etc.

TIME -- (continued)

Ephemeri,, (ET) -- A uniform time based on the motion of the earth around the Sun. (See **second; time, atomic (AT); time, universal (UT); U.S. frequency standard**.)

Equation of -- The difference in hour angle between apparent solar time and mean solar time. The Sun is sometimes before and sometimes behind the mean Sun by an amount of time that ranges from 0 to about 16 minutes. Since the equation of time may by expressed as a correction to either apparent solar time or mean solar time, its sign must be carefully observed.

Greenwich Mean (GMT) -- Mean solar time for the Greenwich meridian, counted from midnight through 24 hours. Also called "Universal Time" (UT).

Greenwich Sidereal (GST) -- The sidereal time for the Greenwich meridian.

Local apparent -- The apparent solar time for the meridian of the observer.

Local mean -- The mean solar time for the meridian of the observer.

Local sidereal -- The sidereal time for the meridian of the observer.

Mean solar -- Time measured by the diurnal motion of a fictitious body (called "mean Sun") which is supposed to move uniformly in the celestial Equator, completing the circuit in one tropical year. Often termed simply "mean time". The mean Sun may be considered as moving in the celestial Equator and having a right ascension equal to the mean celestial longitude of the true Sun. At any given instant, mean solar time is the hour angle of the mean Sun. In civil life, mean solar time is counted from the two branches of the meridian through 12 hours; the hours from the lower branch are marked a.m. (ante meridian), those from the upper branch, p.m. (post meridian). In astronomical work, mean solar time is counted from the lower branch of the meridian through 24 hours. Naming the meridian of reference is essential to the complete identification of the time. (See **time, standard**.) The Greenwich meridian is the reference for a worldwide standard of mean solar time, called "Greenwich Mean Time" or "Universal Time". (See **time, equation of**.)

Sidereal -- Time measured by the apparent diurnal rotation of the "true" vernal equinox. At any instant, sidereal time is the hour angle of the vernal equinox. It is counted through 24 hours starting when the vernal equinox is on the meridian. Naming the meridian of reference is essential to its complete identification. Due to small differences between the positions of the true and mean equinoxes, sidereal time, like the sidereal day, is subject to

TIME -- (continued)

Sidereal (continued)

slight irregularities. The irregularities are absent from "uniform" sidereal time, which is measured by the motion of the mean equinox and is used in rating clocks of the highest precision.

Standard -- Mean solar time for a selected meridian adopted for use throughout a belt (zone). In the continental United States, the meridians of reference for standard time are multiples of 15° from the initial (Greenwich) meridian. The standard time for each belt is designated by the number of its meridian and also by some name of geographic significance: 75th meridian or Eastern Standard Time, 90th meridian or Central Standard Time, 105th meridian or Mountain Standard Time, and 120th meridian or Pacific Standard Time. The standard time meridians for Alaska are 150° and 165° west longitude; for Hawaii, 150° west longitude; and for the Philippine Islands, 120° east longitude. Standard time was established in 1883 to correlate train schedules of various railroads over the same areas. The standard time belts were planned to be roughly symmetrical with respect to the meridians of reference and to extend 7-1/2° to either side thereof. Practical considerations such as the need for time correlation between cities outside the original boundaries of a time belt and cities within the belt have caused a gradual shifting of those boundaries until some of them now exhibit large irregularities. (See **time, daylight saving**.)

True solar -- (See **time, apparent solar**.)

Universal (UT) -- The same as Greenwich Mean Time. A nonuniform time based on the rotation of the earth, which is not constant. (See **time, atomic; time, ephemeris; U.S. Frequency Standard**.)

Zulu (Z) -- An identifier for Greenwich Mean Time.

TIME CONSTANT (transducer) -- The length of time required for the output of a transducer to rise to 63 percent of its final value as a result of a step change of measurand. (See **rise time**.)

TIME DELAY (systems) -- Total elapsed time or lag required for a command to be effected after it is given.

TIME DIVISION MULTIPLEX -- A system which transmits information to two or more quantities (measurands) over a common channel by dividing available time intervals among the measurands to form a composite pulse train.

TIME FRAME (telemetry) -- The time period containing all elements between corresponding points of two successive reference markers.

TIME OF FIRST MOTION -- The instant a launch vehicle first begins to accelerate under normal thrust as sensed by accelerometers in the vehicle and relayed to range instruments by a telemetry link.

TIME SHARING -- Use of a device or an equipment configuration for two or more purposes during the same overall time interval; accomplished by interspersing component actions during the time frame indicated.

TIME SLICING -- Allowing each task a maximum period of time to execute before it is placed in a line of tasks that are vying for system resources.

TIMING PARALLAX -- The distance on a film between a frame and a time signal which were simultaneously exposed. Sometimes called "indexing error".

TORQUE ERROR (transducer) -- (See **mounting error**.)

TOTAL BENDING -- The change in direction of a ray between object and observer.

TOTAL REFRACTION -- The return of waves out of a medium or layer due to refraction. Total refraction occurs most readily at low elevation angles. For any suitable layer in the atmosphere, there is a critical beam-elevation angle below which total refraction can occur. In the ionosphere, this angle is frequency-dependent. (See **refraction**.)

TRACEABILITY (calibration) -- The relation of a transducer calibration to an instrument or a group of instruments calibrated and certified by the National Bureau of Standards (NBS).

TRACK -- 1. That portion of a magnetic tape upon which one channel of information can be recorded; usually limited in length by the length of the tape and in width by the width of the gap in the head. **2.** To follow an object or signal with an instrumentation system.

TRACKER'S TELESCOPE -- An optical system used with tracking instruments to enable the operator to view the object of interest.

TRACKING AID -- A beacon, transponder or radiation source in a missile which is designed to aid in establishing the missile's position. (See **beacon; RACON; transponder**.)

TRACKING ANTENNA -- A directional antenna system which automatically follows the motion of a moving signal source or target.

TRACKING FILTER -- 1. An electronic device for attenuating unwanted signals while passing desired signals by means of phase lock techniques which reduce the effective bandwidth of the circuit and eliminate amplitude variations. **2.** A bandpass filter whose center frequency follows the average frequency of the input signal.

TRACKING (OFFSET) ERROR -- The angular error in magnitude and direction between an object being tracked and the center of reference established for the tracking instrument.

TRACKING RATE -- The rate at which a system follows or tracks an object or signal; usually expressed in terms of the rate of change of the parameter being measured.

TRAJECTORY -- A flight path as described by the center of mass of the missile or airframe; the representation of this flight path in some form.

TRAJECTORY ANGLES -- Angles formed by the missile velocity vector with coordinate axes. Not aspect angle. (See **flight path angle**.)

TRAJECTORY MEASURING SYSTEM -- A system used to provide spatial position of an object at discrete time intervals throughout a portion of the trajectory or flight path.

TRAJECTORY MESSAGE -- A special launch notification message that is transmitted before a launch operation. The message may contain launch date and time, an abbreviated nominal trajectory, and/or nominal time of significant staging and thrust termination events.

TRANSDUCER -- A device by which energy flows from one or more transmission systems to one or more additional transmission systems. The energy may be electrical, mechanical or acoustical, etc.

A-C -- A transducer which must be excited with alternating current only. Also, a device whose output appears in the form of an alternating current.

TRANSDUCER (continued)

Bi-directional -- A transducer capable of measuring stimulus in both a positive and a negative direction from a reference zero or rest position.

D-C -- A transducer capable of proper operation when excited with a source of direct current. The output of such a transducer is also given in terms of direct current unless otherwise modified by the function of the stimulus.

Differential -- A transducer capable of measuring two separate stimulus sources simultaneously and providing an output proportional to the difference between the stimuli.

Electrochemical -- A transducer which uses a chemical change to measure the input parameter, the output of which is a varying electrical signal proportional to the measurand.

Force balance -- A transducer whose output from the sensing member is amplified and fed back to an element which causes the force-summing member to return to its rest position. The magnitude of the signal fed back constitutes the output of the device.

Inductive -- A transducer whose stimulus information is conveyed by means of changes in inductance.

Ionization -- A transducer in which the displacement of the force-summing member is sensed by means of induced changes in differential ion conductivity.

Photoelectric -- A transducer which converts changes in light energy to changes in electrical energy.

Piezoelectric -- A transducer whose method of transduction is accomplished by means of the piezoelectric properties of certain crystals or salts.

Potentiometric (pot) -- A transducer in which the displacement of the force-summing members is transmitted to the slider in a potentiometer, thus changing the ratio of output resistance to total resistance. Transduction is accomplished in this manner by the changing ratios of a voltage divider.

Self-generating -- A transducer which does not require external electrical excitation to provide specified output signals.

TRANSDUCER -- (continued)

Thermoelectric -- A transducer whose signal output depends on a voltage generated at the junction of two selected dissimilar metals due to the

action of thermal energy.

Unidirectional -- A transducer which measures stimulus in one direction only from a reference zero or rest position.

Variable capacitance -- A transducer which measures a parameter or change in a parameter by means of a change in capacitance.

Variable inductance -- A transducer whose output voltage is a function of the change in a variable inductance element.

Variable resistance -- A transducer whose signal output is a function of the change in a variable resistance element.

Velocity -- A transducer which generates an output proportional to imparted 1 velocities.

TRANSFER (computer) -- 1. A machine instruction which can alter the regular sequence of execution instructions. **2.** To move a block of data.

TRANSIT -- 1. The apparent passage of a star or other celestial body across such defined lines of the celestial sphere as a meridian, prime vertical, or almucantar. The apparent passage of a star or other celestial body across a line in the reticle of a telescope, or some line of sight. The apparent passage of a smaller celestial body across the disk of a larger celestial body. (See **occulation**.) **2.** A surveying instrument composed of a horizontal circle graduated in circular measure and an alidade with a telescope which can be reversed in its supports without being lifted. Also, the act of making such a reversal. **3.** An astronomical instrument having a telescope which can be adjusted so the line of sight is made to define a vertical circle.

TRANSLATOR (computer) -- A routine for changing information from one representation or language to another.

TRANSMIT-RECEIVE (T-R) SWITCH -- A gas tube switch which prevents the transmitted energy from reaching the receiver, but allows the received energy to reach the receiver without appreciable loss.

TRANSPONDER -- A transmitter-receiver capable of accepting the challenge of an interrogator and automatically transmitting an appropriate reply.

TRANSPORT -- The mechanical portion of a magnetic tape recorder that physically handles or drives the magnetic tape during recording, rewind and playback operations.

TRANSVERSE ACCELERATION -- In accelerometers, the acceleration which is applied in any direction perpendicular to the axis of sensitivity.

TRANSVERSE SENSITIVITY (transducer) -- The maximum sensitivity of a transducer to a specified value of a measurand applied in a direction perpendicular to the sensitive axis of the transducer.

TRAP (computer) -- (See **interrupt**.)

TRIANGULATION -- A method of surveying in which the stations are points on the ground at the vertices of a chain or network of triangles whose angles are observed instrumentally and whose sides are derived by computation from selected triangle sides called baselines, the lengths of which are obtained from direct measurements on the ground. Triangulation permits the selection of sites for stations and baselines favorable for both topographic and geometric uses. (See **strength of figure**.) The method is well adapted for precision instruments and all operational methods and provides accurate and precise results. Triangulation is generally used when the area surveyed is large and requires the use of geodetic methods. It may include not only the actual operations of observing angles and measuring baselines and their mathematical processing, but also the reconnaissance which precedes those operations, i.e., the astronomic observations which are required in the establishment of a geodetic datum and in the control of the triangulation.

Area -- A system of triangulation designed to progress in every direction, usually consisting of a network of single triangles. Area triangulation is executed to provide survey control points over an area (city or county) or to fill the areas between arcs of triangulation. Area triangulations for the national network conform to second-order class I specifications.

Flare -- A method of triangulation by which simultaneous observations of parachute flares are made. This method is used for extending triangulation over lines too long to be observed by ordinary methods.

First-order --

Class I (special) -- Designed for urban surveys, scientific studies and extremely accurate extended baselines. Minimum specifications include probable error of closure in length at least 1 in 100,000; average triangle

TRIANGULATION (continued)

First-order (continued)

closure not to exceed 1.0 s, side checks 1.5 times tabular difference for 1" of log sine of smallest angle involved, etc. Major procedures include two-nights horizontal observations; additional geodimeter bases, tightened specifications for observation rejection limits, observing techniques, and plumbing towers; maximum strength of figure in designing scheme, etc. Where accuracy greater than 1 in 100,000 is desired, above specifications and procedures are changed to meet such a requirement.

Class 11 (optimum) -- The basic network of arcs. Minimum specifications include: probable error of closure in length - 1 in 50,000, side checks - 1.5 to 2.0 times the tabular difference for I" of log sine of the smallest angle involved, average triangle closure - 1.0 s, maximum triangle closure - 3.0 s, etc. Major procedures include one-night observations using prescribed instruments and techniques, strength of figure, etc.

Class III (standard) -- Used in all other first-order surveys not needing the accuracy of class I or class II. Minimum specifications include: probable error of closure in length - 1 in 25,000, side checks - 2.0 times tabular difference for 1" of log sine of smallest angle involved, average triangle closure - 1.0 s, maximum triangle closure - 3.0 s, etc. Major procedures include one-night observations using prescribed instruments and techniques, strength of figure, etc. This class of first-order triangulation was called "first-order triangulation" prior to 1957. The results obtained in the national network using the above specifications and procedures exceeded I part in 50,000 and led to upgrading and reclassifying geodetic control surveys.

Second-order --

Class I -- Area networks between arcs of the national network. Minimum specifications include: probable error of closure in length - 1 in 20,000, average triangle closure - 1.5", side checks - 2-4 times the tabular difference for 1" of log sine of smallest angle involved, etc. Procedures are the same as for first-order class II and class III triangulation except that the rejection limit for a single observation ,is relaxed from 4" to 5" from the mean of the 16 observations.

TRIANGULATION (continued)

Class II -- Coastal area, inland waterways, engineering and topographic control. Minimum specifications include: probable error of closure in

length - 1 in 10,000, average triangle closure - 3", side checks - 4 times the tabular difference of 1" of log sine of smallest angle involved. Procedures include daytime observation, second-order instruments, etc. This class of second-order triangulation was formerly called "second-order triangulation" prior to 1957.

Ship-shore -- A method of extending triangulation along a coast by making simultaneous observations from three or more short stations on a target mounted on a ship. This method is used only when it is impractical to establish a chain of triangles or quadrilaterals.

Third-order -- Triangulation which does not attain the quality of the second-order triangulation but conforms to the following criteria: the average error of closure of the main-scheme triangles shall not exceed 5", the maximum error of closure of the main-scheme triangles shall not exceed 10", and the closure in length on a measured baseline or on a line of adjusted triangulation shall not exceed 1/5000 of the length of the line after the angle and side equations have been satisfied in the adjustment. The classification of third-order triangulation was not changed in 1957.

TRIANGULATION ARC -- A system of triangulation forming a band or belt on the surface of the earth or a corresponding system of positions, lines and angles on the surface of the spheroid. The axis of a triangulation arc may approximate in position an arc on the spheroid following a meridian of longitude, a parallel of latitude, or an oblique arc. It may also follow a natural feature like a river or an artificial feature like a civil boundary. It is usually given an identifying name based on its general or particular location or geographic significance, i.e., Ninety-eight Meridian Arc, Mississippi River Arc, etc.

TRIANGULATION STATION -- A point on the earth whose position is determined by triangulation.

TRIANGULATION TOWER -- A triangulation signal consisting of two separate structures independent of each other: an inner structure which supports the theodolite and sometimes the target or signal lamps, and an outer structure which supports the observer and his assistant and sometimes the target or signal lamps. Triangulation towers are used to elevate the line of sight above trees, topographic features, and other obstacles that might interfere with observations.

TRIBRACH -- The three-arm base of a surveying instrument which carries the foot screws used in leveling the instrument. Many surveying instruments have a four-screw base or quadribrach.

TRIDOP -- A continuous wave trajectory measuring system using the Doppler shift caused by a target moving relative to a ground transmitter and three or more receiving stations. Similar to DOVAP in principle and data reduction techniques, the main difference being that TRIDOP interrogation is at 132.48 MHz with transponder reply at 264.96 MHz.

TRILATERATION -- A method of extending horizontal control where the sides of triangles are measured rather than the angles as in triangulation.

TRIPLEXER -- A dual-duplexer which permits the use of two receivers simultaneously and independently in a radar system by disconnecting the receivers during the transmitted pulse.

TRIVET -- A device used in place of a tripod for supporting a transit or level . It is essentially a tripod head with three very short legs cast as a single piece of metal. It is used for placing a transit or level in a position where a regular tripod could not be conveniently used or where greater stability is desired. When used for a theodolite, a trivet may include the footplate with V-shaped grooves cut to accommodate the feet of the leveling screws.

TROPIC OF CANCER --

Astronomy -- The parallel of declination passing through the summer solstice.

Geography -- The geographic parallel whose latitude corresponds to the declination of the summer solstice. The obliquity of the ecliptic is steadily changing so that the summer solstice is not a point of fixed declination. When the Tropic of Cancer is shown on a terrestrial map, it should be treated as a line of fixed latitude. Thus, it has been proposed that the value 23° 27" north latitude be used. In popular usage, the term "tropics" is sometimes applied to the belt of the Earth's surface bounded by the Tropic of Cancer and the Tropic of Capricorn. But in technical language, the term designates the lines themselves, and the included area is known as the "Torrid Zone". The term "tropics" also has a climatic connotation.

TROPIC OF CAPRICORN --

Astronomy -- The parallel of declination passing through the winter solstice.

Geography -- The geographic parallel whose latitude corresponds to the declination of the winter solstice. The obliquity of the ecliptic is steadily changing so that the winter solstice is not a point of fixed declination. When the Tropic of Capricorn is to be shown on a terrestrial map, it should be treated as a line of fixed latitude. For this purpose it has been proposed that the value 23° 27' south latitude be used. (See **Tropic of Cancer**.)

TROPOPAUSE -- The boundary between the troposphere and stratosphere, usually characterized by an abrupt change of lapse rate. Such change is in the direction of increased atmospheric stability from regions below to regions above the tropopause. Its height varies from 15 to 20 km in the tropics to about 10 km in polar regions. In polar regions in winter it is often difficult or impossible to determine just where the tropopause lies since, under some conditions, there is no abrupt change in lapse rate at any height. It has become apparent that the tropopause consists of several discrete overlapping "leaves"; a multiple tropopause, rather than a single continuous surface. In general, the leaves descend in a step-like fashion from the Equator to the poles.

TROPOSPHERE -- That portion of the atmosphere from the Earth's surface to the tropopause, i.e., the lowest 10 to 20 km of the atmosphere. The troposphere is characterized by decreasing temperature with height, appreciable water vapor content, and the presence of weather.

TROUGH (meteorology) -- An elongated area of relatively low atmospheric pressure; the opposite of a ridge. The axis of a trough is the trough line.

TRUE WIND DIRECTION -- The direction, with respect to true north, from which the wind is blowing; distinguished from magnetic or relative wind direction. In all standard upper-air and surface-weather observations, it is the true wind direction that is reported, usually in terms of tens of degrees in the 360° compass.

T-STOP -- A system of stop-marking based on the actual light transmitted by a lens at various stops. T-system markings differ from the f-system markings in that the T-system takes into account light lost by internal reflections and light gained from the application of low reflection coatings on lens surfaces. The T-number and the f-number are identical only when the lens is made of completely nonabsorbing and nonreflecting material (See **stop**.)

TUMBLING -- An unsatisfactory attitude situation in which the vehicle continues on its flight but turns end-over-end about its transverse axis.

TURBULENCE -- (See **optical turbulence; microwave turbulence**.)

TURBULENT SCATTER -- (See **scatter**.)

TURNAROUND TIME --

Range operations -- The interval of time necessary to execute an instrumentation plan between two successive range operations. This may include, but is not limited to, personnel travel, instrument movement, unloading and/or loading of film, reorientation warm-up , and checkout.

Computer -- The total time required for submission of the program to the machine room, processing of the program through the computer, and delivery of the processed program back to the programmer. (See **thru-put time**.)

TWELVE PUNCH -- A punch in the top row of a punch card.

TWO-ADDRESS INSTRUCTION (computer) -- Having the property that each complete instruction includes an operation and specifies the location of two registers, usually one containing an operand and the other the result of the operation.

TYPE BAR -- A linear type element containing all printable symbols.

U

ULTRA-HIGH FREQUENCY DOVAP (UDOP) -- A DOVAP-type trajectory measuring system operating in the UHF band. (See **DOVAP**.)

ULTRAVIOLET REGION -- The region of the electromagnetic spectrum between visible light and X-rays; commonly about 150 to 4000 angstroms.

UNBALANCE (transducer) -- The difference between the real output and the desired output at zero measurand from an instrument or system which is properly energized.

UNCONDITIONAL TRANSFER INSTRUCTION (computer) -- An instruction which causes a transfer of control to take place in all cases and under any conditions.

UNDERFLOW (computer) -- The generation of a quantity smaller than the accepted minimum, e.g., floating point underflow.

UNDERPUNCH -- A second hole in a card column which is below the original hole in a punch-card code.

UNIVERSAL TIME (UT) --

UT-C -- Universal Time Coordinated. The Universal Time emitted by coordinated radio stations. UT-C is an approximation of Universal Time and is generated by an oscillator whose frequency is held constant each year with respect to the atomic unit of time interval. UT-C is kept within 100 milliseconds of UT-2.

UT-0 -- Uncorrected Universal Time, astronomically observed.

UT-1 -- Universal Time corrected for observed polar motion.

UT-2 -- **1.** A measure of the mean speed of the earth. Periodic variations are removed, but UT-2 is not uniform time because of progressive changes in the speed of rotation of the earth. UT-2 is obtained from the United States Naval Observatory. **2.** Universal Time corrected for observed polar motion and for extrapolated seasonal variations in the speed of the Earth's rotation.

UNPACK (computer) -- To recover the original data from packed data. (See **pack**.)

UPPER AIR (Meteorology) -- That portion of the atmosphere which is above the lower troposphere. Although no distinct lower limit is set, the term is generally applied to the levels above 850 mb.

UPPER-AIR OBSERVATION; UPPER-AIR SOUNDING -- A measurement of atmospheric conditions aloft, i.e., above the effective range of a surface weather observation. This is a general term usually applied to those observations which are used in the analysis of upper-air charts, as opposed to measurements of upper atmospheric quantities primarily for research. Among the elements evaluated are temperature, humidity, pressure (by radiosonde, wiresonde, aircraft observation or kite observation), and windspeed and direction **(**by winds-aloft observations).

UPPER ATMOSPHERE -- The general term applied to the atmosphere above the troposphere. For subdivisions of the upper atmosphere, see "atmospheric shell".

UPPER LEVEL WINDS -- (See **winds aloft**.)

U.S. FREQUENCY STANDARD (USFS) -- A standard frequency signal maintained by NBS as constant as possible with respect to atomic time.

U.S. STANDARD FREQUENCY BROADCASTS -- Radio frequencies broadcast by WWV and WWVH. The carrier frequencies are kept in close synchronism with, but offset from, the USFS. The offset is to make the United States time signal pulses more closely agree with UT-2.

U.S. TIME SIGNALS -- Timing pulses carried by the United States Frequency Broadcasts. The pulses are locked to the nominal frequency of the radio-frequency carrier and are adjusted (to bring them into synchronism with UT-2) only at intervals. Consequently, United States timing signals depart continuously from UT-2. Corrections for converting to UT-2 are determined and published by the United States Naval Observatory.

UTILITY ROUTINE -- A standard routine usually of a service or housekeeping nature, i.e., a conversion routine, a printout routine, a tracing routine, etc. Also called a "utility program".

V

VANE -- (See **wind vane**.)

VAPOR CONCENTRATION (meteorology) -- The ratio of the mass of the water vapor in the atmosphere to the volume occupied by the mixture of the water vapor and other gases; e.g., a cubic meter of the atmosphere may contain 5 grams of water vapor, the vapor concentration is then 5 grams per cubic meter.

VAPOR DENSITY (meteorology) -- (See **vapor concentration**.)

VAPOR PRESSURE; VAPOR TENSION -- The pressure exerted by the molecules of a given vapor. For a pure confined vapor, the pressure on the walls of its containing vessel and for a vapor mixed with other vapors or gases, that vapor's contribution to the total pressure, i.e., its partial pressure. In meteorology, vapor pressure is used almost exclusively to denote the partial pressure of water vapor in the atmosphere. Care must be exerted in interpreting the term's meaning when used by other branches of science.

VARIABLE FOCUS LENS -- A lens system, part of which is movable, designed to correct lens aberrations, and provide continual sharp focusing of the image on the receiving film and constant f-value as the focal length is changed. Commonly called "zoom lens".

VARIABLE RADIO-FREQUENCY RADIOSONDE -- A radiosonde whose carrier frequency is modulated by the magnitude of the meteorological variables being sensed.

VARIATE DIFFERENCE METHOD (dispersion estimating) -- A high-order difference method of numerical calculus for deriving a measure of dispersion analogous to the standard error of estimate.

$$S_p \cong \frac{(p!)^2}{(2p)!(n-p)} \sum_{i=p+1}^{n} \left(\Delta^p Y_1\right)^2$$

where n = number of samples in the groups, p = the order of the backward difference, I = number of backward differences in the p^{th} order column, $\Delta^p y_i = i^{th}$ backward difference of order p. The order p must be large enough to remove all trends so that successive values are random. Ordinarily, p is 3, 5 or 10. The number of samples "n" in a group usually is chosen to be a value between 10 and 100. Ordinarily, n is 25.

VARIATION OF THE POLE -- A wandering of the poles of figure of the earth with respect to its poles of rotation. The direction in space of the poles of rotation of the earth rarely varies. These poles are the points on the celestial sphere reached by the Earth's axis. The axis of figure of the earth, or axis within the earth about which the moment of inertia is a maximum, is not coincident with its axis of rotation when extended to the celestial sphere. This axis describes a path for each pole of rotation. This path is irregular, although an annual and a 14-month periodicity in the motion may be detected. The maximum variation in direction of the axis of figure from a mean position with respect to the axis of rotation ranges between 0.1" and 0.3". Variation of the pole affects observed determinations of astronomic latitude, longitude, and azimuth, but is taken into account in first-order work only.

VECTOR -- 1. A quantity that requires a magnitude and direction for its complete specification. **2.** To guide an airplane or missile by means of a transmitted signal, i.e., voice, radio.

VECTOR INDICATOR -- A device which provides complete missile trajectory and look angle data with respect to the target in terms of either the missile or the target.

VELOCIMETER -- A continuous wave reflection Doppler system used to measure the radial velocity of an object.

VELOCITY COMPONENT -- Velocity along a specified axis, usually one of the coordinate axes.

VELOCITY OF SOUND -- The distance traveled by sound waves in unit time through a given medium.

VERIFIER -- A punch-like device to check the inscribing of data by re-keying.

VERNIER SCALE -- A short scale which slides along the divisions of a graduated instrument to indicate parts of divisions.

VERTICAL -- The direction in which the force of gravity acts. It is the direction indicated by a plumb line, and does not usually coincide with the direction of the normal at a point. The term "vertical" uses the geoid as a reference ("normal" applies to the spheroid). (See **zenith** or **nadir**.)

VERTICAL CIRCLE -- Any great circle of the celestial sphere passing through the zenith and nadir. Also, a divided circle mounted on an instrument in such a manner that the plane of its graduated surface can be placed in a vertical plane.

VERTICAL WIRE SKYSCREEN (safety) -- An adjustable mounting for two fixed vertical parallel wires which, when properly aligned, define a vertical plane in space passing through the launch pad.

VIBRATION ERROR (transducer) -- The maximum change in output, under ambient conditions, at any measurand value within the specified range when vibration levels of specified amplitude and range of frequencies are applied to the transducer along specified axes.

VIBRATION ERROR BAND (transducer) -- The error band applicable when vibration levels with a specified range of frequencies and amplitudes are applied to a transducer along specified axes.

VIBRATION SENSITIVITY (transducer) -- The peak instantaneous change in output at a given sinusoidal vibration level for any one stimulus value within the range of an instrument. Usually expressed in percentage of full-scale output per vibratory "g" over a given frequency range. It may also be specified as a total error in percentage of full-scale output for a given vibratory acceleration level.

VIDEO RECORDING (magnetic tape) -- Methods of recording information having a. bandwidth in excess of 500 kHz on a single track.

VINCULUM -- A short, horizontal bar placed over the seconds of a numerically expressed angle or direction to indicate that the seconds are a value of minute one less than is recorded. A double vinculum indicates a value of minutes two less than is recorded. When recording an angle or a direction observed with instruments capable of making several independent readings of the circle (verniers or micrometer microscopes) the degrees, minutes and seconds are usually recorded for one vernier or microscope and only the seconds for the other verniers or microscopes. When the seconds read for the B vernier are associated with minutes less than those recorded for the A vernier, a vinculum, or (rarely) a double vinculum is placed over the seconds reading of the B vernier.

VIRTUAL IMAGE -- An image from which the wavefronts do not actually originate but only appear to do so.

VISCOUS DAMPING -- Energy dissipating characteristic of a medium which is proportional to the medium's time rate of deformation.

VISCOUS PROCESSING -- (See **processing**.)

VISIBILITY -- The greatest distance in a given direction at which it is just possible to see and identify with the unaided eye: (a) in daytime, a prominent dark object against the sky at the horizon, (b) at night, a known, preferably unfocused,

moderately intense, light source. "Visibility" is a sensory measurement since it is an estimate of the visual range by an individual observer. Visibility may be different numerically from the visual range since the former poses the added requirement of recognition of the object; a requirement which may lead to different estimates by different observers. A third quantity, "meteorological range", is a daytime measurement which equates transmissivity to visibility by assuming a constant contrast threshold. The term "runway visual range" makes this same assumption plus assumes a constant illuminance threshold.

VOLTAGE BREAKDOWN TEST -- The application of a specified voltage between given points in a transducer, circuit or device to determine whether breakdown (arcing) occurs at that voltage.

VOLTAGE STANDING WAVE RATIO (VSWR) -- The ratio of the maximum to minimum voltage of a standing wave in a transmission system.

W

WAVE, VERTICALLY POLARIZED -- A linearly polarized wave whose electric field vector is vertical with respect to the Earth's surface.

WAVEGUIDE SHUTTER -- A vane within a waveguide which is used to protect the receiver system from adjacent radar power when a companion transmitter is operating, by establishing an electrical short across the waveguide.

WAVE PROPAGATION -- The transmission of RF energy through space.

WHEEL PRINTER -- A printwheel having a type font engraved on its face.

WIDE-ANGLE LENS -- A lens having a wider angle of view than customary; generally, any lens having a wider angle of view than 50°. Such lenses are constructed similarly to normal lenses, but elements are ground with deeper curves and the components are placed closer together. The maximum aperture is usually small, i.e., f/6.3 or f/8.

WIND ROSE -- Any one of a class of diagrams designed to show the distribution of wind direction experienced at a given location over a considerable period, i.e., the prevailing wind direction. The most common form consists of a circle from which 8 or 16 lines emanate, one for each compass point or direction. The length of each line is proportional to the frequency of wind from that direction. The frequency of calm conditions is entered in the center. Many variations exist: some indicate the range of windspeeds from each direction, some relate wind directions to other weather occurrences.

WIND SHEAR -- The local variation of the wind vector or any of its components in a given direction.

WIND VANE -- An instrument used to indicate wind direction which consists, basically, of an asymmetrically-shaped object mounted at its center of gravity about a vertical axis. The end which offers the greater resistance to the motion of air moves to the downwind position. The direction of the wind is determined by reference to an attached oriented compass rose. The direction is frequently telemetered by a nine-light indicator or by synchros.

WINDS ALOFT -- Generally, the windspeeds and directions at various levels in the atmosphere above the domain of surface weather observations.

WINDS-ALOFT OBSERVATION -- The measurement and computation of windspeeds and directions at various levels above the surface of the earth. Such methods include: visual tracking ascending balloons with a theodolite, tracking radio signals emitted by an ascending radiosonde or other type of transponder with a radio direction finder, and tracking a free-floating radar target with a radar (sometimes in combination with a radiosonde). Tracking high-altitude, constant-level balloons (transondes) may be considered to fall within this group. Winds-aloft data are included in many aircraft observations, particularly weather reconnaissance flights.

WIRE LINK TELEMETRY; HARD WIRE TELEMETRY -- Telemetry in which a hard wire link is used as the transmission path instead of a radio link.

WIRESONDE -- An atmospheric sounding instrument supported by a captive balloon, which is used to obtain temperature and humidity data from ground level to a height of a few thousand feet. Height is determined by means of a sensitive altimeter or by the amount of cable released and the angle which the cable makes with the ground. The information is telemetered to the ground station through a wire.

WORD (computer) -- An ordered set of pulses having a meaning and is considered to be a unit by a computer. In parallel PCM, a word may have no meaning related to the data formed by the pulses placed on parallel channels for transmission. In serial PCM, a word containing a single code is usually the basic structural unit of the format.

WORD LENGTH -- 1. The number of bits or characters handled as a physical unit by a computer or other device. **2.** The size of a field.

WORD TIME (computer) -- The time required to transfer a machine word from one storage position to another.

WORK PRINT -- A positive print compiled during the editorial process which consists of original footage, picture library prints, and prints of dissolves, montages, titles, etc.

WORKING STORAGE (computer) -- A portion of internal storage reserved for immediate results; temporary storage.

WOW (magnetic tape) -- A slow periodic change in pitch observed when reproducing recorded sounds because of a nonuniform rate of reproduction of the original sound.

WOW AND FLUTTER -- Terms which refer to speed change errors in magnetic tape recording and playback.

WRITE -- 1. Computer terminology for recording on magnetic tape. **2.** To transfer information from internal storage to auxiliary storage or to an output device.

X

X-PUNCH -- The 11th punch row in a punch-card code.

Y

YAW -- An angular motion about the yaw axis. (See **axis, yaw**.)

YAW ANGLE -- An angular displacement about the yaw axis between the roll axis and a reference plane normally defined by a line tangent to the vehicle's trajectory and the gravitational vector. The angle is positive when the yaw is to the right. (See **axis, yaw**.)

YAW PLANE -- A plane normal to the yaw axis and defined by the roll and pitch axes. (See **axis, yaw**.)

YEAR -- An interval of time based on the revolution of the earth in its orbit around the Sun with respect to the stars.

Anamalistic -- The interval of time between two successive passages of perihelion by the Sun. The anamalistic year is equal to 365.25964 mean solar days.

Calendar -- A conventional year based on the tropical year. The calendar year takes account of the fraction of a day contained in the tropical year by assigning an additional day to the year at stated periods. The calendar years of interest in this country are defined by the Julian Calendar and the Gregorian Calendar.

Sidereal -- The interval of time occupied by the Sun in completing an apparent circuit of the heavens from a given star back to the same star. The sidereal year is equal to 365.25636 mean solar days.

Tropical -- The interval of time between two successive passages of the vernal equinox by the Sun. The tropical year is the year of the seasons and the basis of the conventional calendar year used in chronology and civil reckoning. It is equal to 365.24220 mean solar days.

Y-PUNCH -- The 12th punch row in punch-card code.

Z

ZENITH -- The point where the direction of the plumb line projected above the horizon meets the celestial sphere. The zenith and nadir are poles of the horizon. The plumb line is perpendicular to the surface of the geoid, but not (except in rare cases) perpendicular to the surface of the spheroid. The angle between the plumb line (the vertical) and the perpendicular to the surface of the spheroid (the normal) is the deflection of the vertical (also called the "deflection of the plumb line"). The terms "geodetic zenith" (or "nadir") and "geocentric zenith" (or "nadir") are also sometimes used. Since their meanings differ from the above definition, such use is not recommended.

Geocentric -- The point where a line from the center of the earth through a point on its surface meets the celestial sphere. This term is sometimes used in astronomic work but seldom appears in geodetic work. It should be used only in its entirety because the single word "zenith" designates the point determined by the direction of the plumb line.

Geodetic -- The Point where the normal to the spheroid, extended upward, meets the celestial sphere. Although this term has some use in geodetic work, it should be used only in its entirety. The single word "zenith" designates the point determined by the direction of the plumb line.

ZENITH CAMERA -- An instrument which determines an astronomic position by photographing a small section of the sky immediately surrounding the zenith. The optical axis may be set very precisely in the vertical so that the photograph is symmetrical with respect to the observer's zenith. The time of each observation is recorded, thus furnishing the information required to compute the astronomic latitude and longitude.

ZENITH DISTANCE -- The vertical angle between the zenith and the object which is observed or defined.

Double -- A value of twice the zenith distance of an object, obtained by observations and not by mathematical process. In trigonometric leveling and in astronomical work, double zenith distances are observed because they are nearly free from the inclination effects of the vertical axis of the instrument used.

ZENITH TELESCOPE -- A portable instrument adapted for the measurement of small differences of zenith distance and used in the determination of astronomic latitude. This instrument consists of a telescope equipped with an ocular micrometer and a spirit level. The telescope is mounted on a vertical axis so it may be placed in the plane of the meridian for observation on a star culminating

north or south of the zenith, and then rotated 180° in azimuth to observe a second star as it culminates south or north of the zenith. The difference of the zenith distances of the two stars is measured with the micrometer. The spirit level is used to determine any change that may occur in the direction of the axis of rotation of the telescope between the two observations.

ZENITH-TELESCOPE METHOD (latitude determination) -- A precise method of determining astronomic latitude by measuring the difference of the meridional zenith distances of two stars of known declination, one north and the other south of zenith. The observations are made with a zenith telescope or with an astronomical transit which can he converted to serve as a zenith telescope. The two stars should have approximately the same meridional zenith distances so their culminations-should occur within a few minutes of each other. The astronomic latitude of the point of observations will be one-half the sum of the declinations of the two stars, plus or minus one-half the difference of their zenith distances. This method is also known as the Horrebow-Talcott method and the Talcott method.

ZERO-ADDRESS INSTRUCTION (computer) -- An instruction which does not include an address.

ZERO COMPENSATION (transducer) -- A method by which the effects of temperature on the output at zero measurand may be minimized and maintained within known limits.

ZEROING -- A deliberate translation of recorded data, or data reduction equipment output, to a position selected as zero reference.

ZERO-LENGTH LAUNCHING -- A technique in which first motion of the missile or aircraft removes it from the launcher.

ZERO LIFT (safety) -- A desired condition resulting from a destruct system action which causes a missile or its pieces to travel no further than the ballistic distance.

ZERO MODULATION NOISE -- The noise arising when reproducing a bulk-erased tape recorded with zero signal into the record head with bias energized. For measurement while simultaneously recording and reproducing a tape, bias leakage must be excluded by filtering.

ZERO PEDESTAL (PAM) -- An arbitrary amplitude level of pulse amplitude modulation (PAM) channel signal corresponding to zero or minimum channel signal to provide for channel synchronization and decommutation.

ZERO RANGE TIME (radar) -- The time that is taken to correspond to zero on the range scale.

ZERO SET (transducer) -- A permanent change in the output of a device at zero measurand due to any cause.

ZERO SHIFT (transducer) -- A temporary change in the output of a device at zero measurand due to any cause.

ZERO SUPPRESSION -- The elimination of nonsignificant zeros to the left of a prescribed point.

ZONE (computer) -- The 12th, llth or 0 punch rows in the punch-card code.

ZONE BITS -- The bits other than the four used to represent the digits in a dense binary code.

ZONE PUNCH -- An additional punch (or punches) in a card column for expanding the number of characters which may be represented. (See **overpunch**.)

ZONAL WIND -- The wind or wind component along the local parallel of latitude; distinguished from the meridional wind. In a horizontal coordinate system fixed locally with the x-axis directed eastward and the y-axis directed northward, the zonal wind is positive if it blows from the west and negative if from the east.

ZOOM LENS -- (See **variable focus lens**.)